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ASTRONOMY.

CHAMBERS.

III.

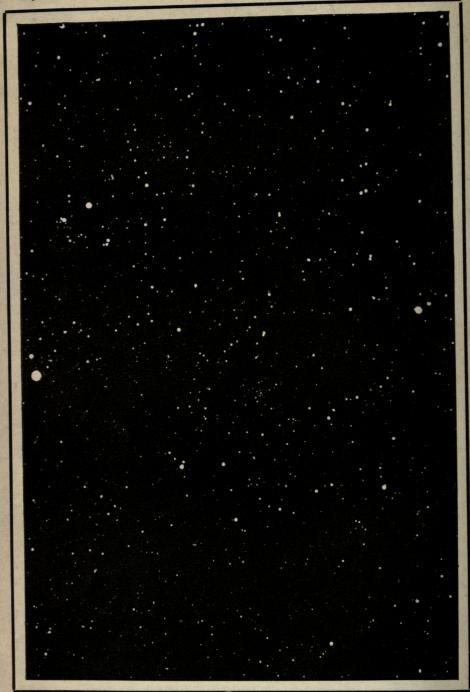
THE STARRY HEAVENS.

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HENRY FROWDE



OXFORD UNIVERSITY PRESS WAREHOUSE AMEN CORNER, E.C.





PART OF THE CONSTELLATION CASSIOPEIA,

Reproduced, untouched, from a Photograph taken at the Paris Observatory, 1887.

A HANDBOOK

OF

DESCRIPTIVE AND PRACTICAL ASTRONOMY.

BY

GEORGE F. CHAMBERS, F.R.A.S.,

OF THE INNER TEMPLE, BARRISTER-AT-LAW;

Author of "A Practical and Conversational English, French, and German Dictionary;"
"The Tourist's Pocket-Book;" "A Digest of the Law relating to Public
Health;" "A Digest of the Law relating to Public Libraries
and Museums;" "A Handbook for Public Meetings;"
and other Works.

"By the Word of the Lord were the Heavens made; and all the Host of them."-Ps. xxxiii. 6.

III.

THE STARRY HEAVENS.

FOURTH EDITION.



AT THE CLARENDON PRESS.

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PREFACE TO THE FOURTH EDITION.

POR an explanation generally of the circumstances under which the matter comprising this volume is now published dissociated from the matter of which it formed a part in former editions reference may be made to the Preface to Vol. I.

Suffice it now to state generally that the contents of this volume have been thoroughly revised and brought up to date, and where necessary extended and re-arranged. Additional objects have been described as types in connection with the chapters on Clusters and Nebulæ, but the most important new features are the chapters furnishing a Photometric Catalogue of Naked-eye Stars, and on finding the constellations during the different months of the year. These supply a hiatus which I have long regretted in the earlier editions of this *Handbook*.

The remarkable developement of the study of Astronomy of late years amongst the middle classes in England has led to a demand for hints as to objects suited to telescopes of popular size, and I have great hopes that the additional woodcuts and letterpress explanation which are given in the text will meet the wishes and requirements of a wide circle of readers.

The proofs have been read for press as before by the Rev. J. B. Fletcher, M.A., and Mr. W. T. Lynn, F.R.A.S., whose zealous and valuable co-operation I desire again to acknowledge.

No one will doubt that science owes a debt of gratitude to the Delegates of the Clarendon Press for undertaking the publication of this new edition in its so greatly enlarged form. Nor must some words of commendation be withheld from Mr. Horace Hart, the Controller of the Clarendon Press, for the skill and patience which he has shown in conducting through the press in such splendid typographical style the three handsome volumes now in the reader's hands. Their publication has been delayed longer than I expected or desired, but for technical reasons slow progress in the printing was deemed expedient.

5. J. C.

NORTHFIELD GRANGE, EAST-BOURNE, SUSSEX: May, 1890.

CONTENTS.

BOOK XIV.

THE STARRY HEAVENS.

CHAPTER I.

INTRODUCTION.

The Pole-star.-Not always the same.-Curious circumstance connected with the Pyramids of Egypt.—Stars classified into different magnitudes.—List of 1st magnitude Stars.—Seidel's proposed standards of magnitudes.—Antiquity of the custom of forming them into groups.—Anomalies of the present system. -Distances of the Stars.-Stellar Parallax.-Stellar Photometry.-Experiments by Seidel, Pickering and Pritchard.—Comparison drawn by Monck of Pickering's results with Pritchard's.—The Stars how distinguished.—Antiquity of the custom of naming Stars.-Invention of the Zodiac.-Letters introduced by Bayer.—Effects of the increased care bestowed on observations of the Stars.—Ideas of the Ancients respecting the Stars.—Remarks by Sir J. Herschel.—Do the Stars radiate heat?—Experiments by Stone.—By Huggins.— The expression "Fixed Stars."-Proper motion of Stars.-Motion of the system through space. - Struve's conclusions. - Wright's hypothesis of a Central Sun.-Revived by Mädler.-Stars thought by Sir W. Herschel to be centres of systems.—Twinkling of Stars.—Humboldt's observations.—Researches of Montigny.

CHAPTER II.

DOUBLE STARS, ETC.

CHAPTER III.

VARIABLE STARS.

Variable Stars.—o Ceti.—Algol.—δ Cephei.—β Lyræ.—R Coronæ Borealis.—
η Argûs.—Miscellaneous remarks.—List of prominent Variable Stars.—Variable Stars of the Algol Type.—U Ophiuchi.—Chandler's generalisations on the colours and periods of Variable Stars.—Statistics by Espin.—Temporary Stars.—Notices of Stars which have disappeared.—Are Temporary Stars and Variable Stars identical in character?

CHAPTER IV.

CLUSTERS AND NEBULÆ.

Arranged in three classes.—Five kinds of Nebulæ.—The Pleiades.—The Hyades.—
Mentioned by Homer.—Præsepe.—Opinion of Aratus and Theophrastus.—
Coma Berenices.—List of Clusters.—Annular Nebulæ.—Elliptic Nebulæ.—
Spiral Nebulæ.—Planetary Nebulæ.—Nebulous Stars.—List of irregular Clusters.—Notes to the objects in the list.—The Nubeculæ major and minor.—
List of Nebulæ in Sir J. Herschel's Catalogue of 1864.—Historical statement relating to the observation of Nebulæ and Clusters.

... 58-98

CHAPTER V.

VARIABLE NEBULÆ.

CHAPTER VI.

THE MILKY WAY.

Its course amongst the stars described by Sir J. Herschel.—The "Coal Seck" in the Southern Hemisphere.—Remarks by Sir W. Herschel as to the prodigious number of stars in the Milky Way.—Computation by Sir J. Herschel of the total number of stars visible in an 18-inch reflector.—Terms applied to the Milky Way by the Greeks.—By the Romans.—By our ancestors.

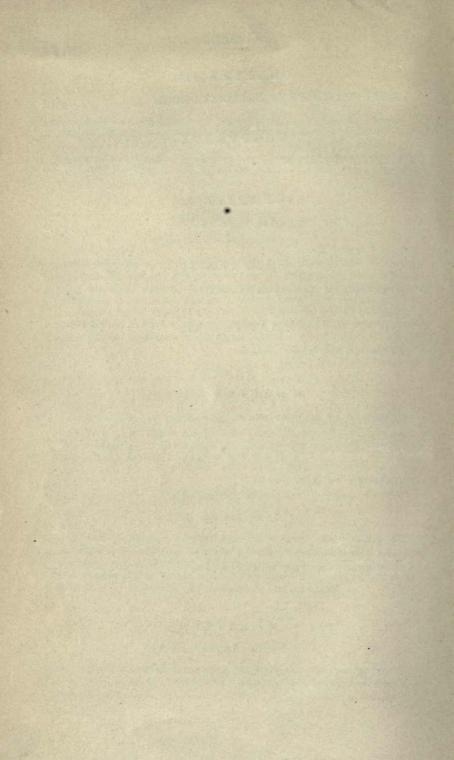
CHAPTER VII.

THE CONSTELLATIONS.

List of those formed by Ptolemy.—Subsequent Additions.—Remarks by Herschel, &c.—Catalogue of the Constellations, with the position of, and Stars in, each.

CHAPTER VIII.

A USEFUL CATALOGUE OF NAKED EYE STARS.	•••		119-236
CHAPTER IX.			
ON FINDING THE STARS			237-253
CHAPTER X.		Way.	
A CATALOGUE OF CELESTIAL OBJECTS			254-270
CHAPTER XI.			
A CATALOGUE OF VARIABLE STARS			271-290
CHAPTER XII.			
A CATALOGUE OF "RED" STARS	•••		291-317
CHAPTER XIII.			
A CATALOGUE OF BINARY STARS			318-331
CHAPTER XIV.			
			332-334
		i)	
INDEX			335
GENERAL INDEX TO THE WHOLE WORK			337



LIST OF ILLUSTRATIONS.

Fig.							1	Page
I.	Part of the Constellation Cassion	peia			. Pla	te I. I	Frontisp	iece.
2.	Head of Hipparchus .						Title-p	age.
3.	Naked-eye view of part of the C	onstella	ation G	emini				18
4.	Telescopic view of the same loca	ality	Service A			Plate	II.	19
5.	Double Star, y Leonis .							28
6.	Triple Star, & Libræ .			14 704				28
7.	Quadruple Star 178 P. XX. Delg	ohini			1			28
8.	The Triple Star (Cassiopeiæ					Plate 1	III.	29
9.	The Triple Star II Monocerotis			The state of		THE PERSON NAMED IN		29
10.	The Triple Star 12 Lyncis						2.7	29
II.	The Triple Star ζ Cancri.		. 7010					29
12.	The Multiple Star θ Orionis	PART O						29
13.	The Multiple Star & Lyræ							29
14.	Two Stars at different distances	seen as	s a "do	uble Sta	ar"			31
15.	£ Ursæ Majoris	·		P. P. St.		9.1		43
16.	The Coloured Star γ Andromeda	æ				Plate I	V. faces	36
17.	The Coloured Star R Leporis					"	,,	36
18.	The Coloured Star & Boötis					,,	,,	36
19.	The Coloured Star & Cygni					.,	,,	36
20.	The Coloured Star σ Cassiopeiæ				. 7	,,	,,	36
21.	The Coloured Star η Cassiopeiæ				. 5	79	,,	36
22.	ε Lyræ. (Smyth.) .		TE USE		>		1	41
23.	€ Lyræ. (Prince.) .					APA JO		41
24.	ε Lyræ. (A. Hall.) .							41
25.	The Multiple Star σ Orionis							42
26.	The Light Curve of η Argûs						1	48
27.	The Pleiades. (Miss Airy.)							59
28.	The Pleiades. (Jeaurat.) .				Ve 9			60
29.	The Hyades					Tall Lening		60
30.	Præsepe, in Cancer .		100			A SEM	400	61

Fig.			Page
31.	The Cluster 3 M Canum Venaticorum. (Smyth.)		63
32.	The Cluster 5 M Libræ. (Sir J. Herschel.)		63
33.	The Cluster 13 M Herculis. (Sir J. Herschel.) .		63
34.	The Cluster 80 M Scorpii. (Smyth.)		64
35.	The Cluster 92 M Herculis. (Smyth.)		64
36.	The Cluster 22 M Sagittarii. (Smyth.)		64
37.	The Cluster II M Antinoï. (Smyth)		64
38.	The Cluster 15 M Pegasi. (Smyth.)		65
39.	The Cluster 2 M Aquarii. (Sir J. Herschel.)		65
40.	The Cluster 2 M Aquarii. (Earl of Rosse.)		66
41.	The Cluster 14 M Ophiuchi. (Smyth.)	Plate V.	67
42.	The Cluster 30 M Capricorni. (Smyth.).	,,	6;
43.	The Cluster 52 M Cephei. (Smyth.)	,,	67
44.	The Cluster 56 M Lyræ. (Smyth.)	,,	67
45.	The Cluster 64 M Comæ Berenices. (Smyth.)	,,	6;
46.	The Cluster 67 M Cancri. (Smyth.)	,,	6
47.	The Annular Nebula 57 M Lyræ. (Sir J. Herschel.)		60
48.	The Annular Nebula 57 M Lyræ. (Earl of Rosse.)		69
49.	The Great Nebula in Andromeda. (G. P. Bond.)		70
50.	The Nebula 65 M Leonis. (Sir J. Herschel.)	Plate VI.	7
51.	The Nebula 65 M Leonis. (Earl of Rosse.)	,•	7
52.	The Nebula 4058 H Draconis. (Earl of Rosse.)		71
53.	The Nebula 42 H V. Comæ Berenices. (Sir J. Herschel.)	asie, mal	7
54.	The Nebula 42 H V. Comæ Berenices. (Earl of Rosse.).		7:
55.	The Spiral Nebula 51 M Canum Venaticorum. (Smyth.)		7.
56.	The Spiral Nebula 51 M Canum Venaticorum. (Sir		
50.	J. Herschel.)		7:
57.	The Spiral Nebula 51 M Canum Venaticorum. (Earl		
21.	of Rosse.)		7
58.	The Spiral Nebula 57 Ht I. Leonis. (Sir J. Herschel.) .	Plate VII.	7
59.		,,	7
60.	The Spiral Nebula 99 M Virginis. (Earl of Rosse.)	,,	7
61.	The Spiral Nebula 55 Ht I. Pegasi. (Sir J. Herschel.) .	**	7:
62.	The Spiral Nebula 55 H I. Pegasi. (Earl of Rosse.)	"	7
63.	The Planetary Nebula 97 M Ursæ Majoris. (Sir	"	27
3.	J. Herschel.)		79
64.	The Planetary Nebula 97 M Ursæ Majoris. (Earl		1:
-	of Rosse.)		-
65.	The Planetary Nebula 297 H II. Virginis. (Sir J.		79
2.	Herschel.)		8
66.	The Nebulous Star & Orionis. (Earl of Rosse.)		8
67.	The Nebulous Star 45 Ht IV. Geminorum. (Key.)		8
68.	The Crab Nebula in Taurus, (Sir J. Herschel.)		8.
00.	The Clab Rebula in Taulus. (Sir J. Herschet.)		0.

	List of Illustrations.			X	iii
Fig.					Page
69.	The Crab Nebula in Taurus. (Earl of Rosse.)				84
70.	The Great Nebula in Orion. (Tempel.)				85
71.	The Trapezium of Orion. (Huggins.)			. 43	86
72.	The Nebula 30 Doradûs. (Sir J. Herschel.)				88
73.	The Nebula surrounding η Argûs. (Sir J. Herschel.)				89
74.	The Nebula surrounding κ Crucis. (Sir J. Herschel.) .	Plate	VIII	faces	3 00
75.	The Nebula 17 M Clypei Sobieskii. (Chambers.)				91
76.	The Dumb-bell Nebula in Vulpecula. (Smyth.)				92
77.	The Dumb-bell Nebula in Vulpecula. (Sir J. Herschel.)				92
78.	The Dumb-bell Nebula in Vulpecula. (Earl of Rosse.) .				93
79.	The Dumb-bell Nebula in Vulpecula. (Earl of Rosse.) .				94
80.	Diagram illustrating Herschel's Stratum Theory of the				
	Milky Way				110
81.	Black void space in the Constellation Sagittarius .				112
82.	Apparent changes in the culmination of Stars				237

AND THE RESIDENCE OF THE PARTY OF THE PARTY

ADDITIONAL ADDENDA ET CORRIGENDA TO VOL. I.

Page

- 53, line 2, for "oberved" read "observed."
- 88, line 11. Schiaparelli has published a very interesting and important paper on Mercury in which he alleges that its rotation-period is the same as that of its revolution round the Sun. (Ast. Nach., vol. cxxiii. No. 2944, Dec. 30, 1889.)

116, line 11. Mädler's calculation is however in error, for there are not 8646 but 8766 hours in a day. The figures in the first column, "At the Equator," should stand:—

4407

864

3495

and in the second, "At the Poles:"-

4450

2403

1913

200, line 8, for "the brothers Ball" read "Cassini."

229, footnote i, for "king" read "ring."

304, line 10, for "Stephan" read "Stephan."

323, line 25, for 478 read 479.

348, line 20, for "Iakutsk" read "Irkutsk."

409, line 11, Brooks's Comet of 1889, discovered after vol. i. went to Press, was seen at the Lick Observatory by E. E. Barnard on many occasions during the month of August to exhibit evident traces of a separation into parts. Besides the main comet, 4 offshoots were certainly visible. (Astron. Journal, No. 202.)

426, line 23, for "New Jersey" read "New York."

483, line 12, for 1611 read 1618.

537, line 8, "Date of Discovery," for "July 1" read "July 2;" "Discoverer," for "Valz" read "Schmidt;" footnote, read 1st clause thus, "Discovered by Tempel a few hours later on the same evening."

yea

Page

547, line 5, for "- March 31" read " 1889, March 31."

548, line 2. Add to the list of known hyperbolic comets: 1889 (i). No. 391 in the Catalogue on p. 546.

551, line 1, for "théoretique" read "théorique."

625, line 13, for 35.134 read 35,134.

648, line 21, for "Abbo" read "Abbé."

668, col. "Name," for "Anabita" read "Anabita."

670, line 2. Small planets discovered since Volume I. was published are:-

282	Clorinde	Charlois	Nice	Jan. 28, 1889.
283	[Unnamed]	"	,,	Feb. 8, ,,
284	[Unnamed]	,,	,	May 29, "
285	[Unnamed]	,,	,,	Aug. 3, "
286	[Unnamed]	Palisa	Vienna	Aug. 3, "
287	Nephthys	Peters C	linton, U.S.,	Aug. 25, ,,
288	[Unnamed]	Luther	Düsseldorf	Feb. 20, 1890.
289	[Unnamed]	Charlois	Nice	Mar. 10, ,,
290	[Unnamed]	Palisa	Vienna	Mar. 20, ,,

VOL. II.

295, line 23, for "Hadley" read "Halley."

348, line 12, for "second" read "third."

367, line 7, for "80 M. Capricorni" read "80 M. Scorpii."

495, Add to Catalogue of Stars:-

1889. Ellery, R. L. J., Second Melbourne General Catalogue 1211
Stars. [Epoch 1880.]

1889. Christie, W. H. M., Ten-Year Catalogue of 4059 Stars observed at Greenwich. [Epoch 1880.]

Figure 56, Plate VI, for (By Bardou.) read (By Secretan.)

VOL. III.

158, line 15, for "Menkar" read "Menkab."

BOOK XIV.

THE STARRY HEAVENS.



CHAPTER I.

INTRODUCTION.

"O ye Stars of Heaven, bless ye the LORD: praise Him, and magnify Him for ever."—Benedicite.

The Pole-star.—Not always the same.—Curious circumstance connected with the Pyramids of Egypt.—Stars classified into different magnitudes.—List of 1st magnitude Stars.—Seidel's proposed standards of magnitudes.—Antiquity of the custom of forming them into groups.—Anomalies of the present system.—Distances of the Stars.—Stellar Parallax.—Stellar Photometry.—Experiments by Seidel, Pickering and Pritchard.—Comparison drawn by Monck of Pickering's results with Pritchard's.—The Stars how distinguished.—Antiquity of the custom of naming Stars.—Invention of the Zodiac.—Letters introduced by Bayer.—Effects of the increased care bestowed on observations of the Stars.—Ideas of the Ancients respecting the Stars.—Remarks by Sir J. Herschel.—Do the Stars radiate heat?—Experiments by Stone.—By Huggins.—The expression "Fixed Stars."—Proper motion of Stars.—Motion of the system through space.—Struve's conclusions.—Wright's hypothesis of a Central Sun.—Revived by Mädler.—Stars thought by Sir W. Herschel to be centres of systems.—Twinkling of Stars.—Humboldt's observations,—Researches of Montigny.

If, on some clear evening, the reader will go out into the open air, and station himself, preferably (if that be possible), on the summit of any rising ground and look upwards, he will see the sky spangled with multitudes of brilliant specks of light; these are the *fixed stars*, so called, though we shall presently see that this appellation is not strictly correct. An attentive observer will soon notice, also, that the stars which he is contemplating seem to revolve in a body around one situated in the North, about (in England) midway between the horizon

and the zenith; this is the *Pole-star*, so designated from its being near the Pole of the celestial equator. Owing, however, to the *Precession of the equinoxes*^a, the present Pole-star (a Ursæ Minoris) will not always be such; the true Pole is now about 1½° from this star, and this distance will gradually diminish until it is reduced to about 26′ 30″ in A.D. 2095; it will then increase again, and after the lapse of a long period of time, the Pole will depart from this star, which will then cease to bear the name of, or serve the purposes of, a Pole-star. About 4600 years ago the star a Draconis fulfilled this office; 12,000 years hence, it will fall to the lot of a Lyræ, a brilliant star of the 1st magnitude, which is now 51° 20′ from the Pole, but which will then have approached to within less than 5° of the polar point b.

Connected with this subject a curious circumstance was noticed during the researches which were made in Egypt many years ago by Colonel Vyse. Of the 9 pyramids which still remain standing at Gizeh, 6 have openings which face the North, leading to straight passages, which descend at inclinations varying from about 26° to 28°, the direction of these passages being, in all cases, parallel to the meridian. Now if we suppose a person to be standing at the bottom of any one of these passages, and to look up it, as he would through the tube of a telescope, his eye will be directed to a point on the meridian 26° or 28° above the plane of the horizon. The altitude at which the star a Draconis must have passed the lower meridian, at the place in question, 4000 years before the present time, is $26\frac{1}{4}$ °. Now the present age of these pyramids (the great pyramid bears the date of 2170 B.C.) corresponds so nearly with this period (2170+1890=4060), that it can hardly be doubted that the peculiar direction given to these passages must have had reference to the position of a Draconis, the then Pole-starc. C. P. Smyth however, pointing out the fact that

^{*} See vol. i. p. 374 (ante).

b For a list of possible Pole-stars between 4800 B.C. and 13800 A.D. see a paper in Ast. Reg., vol. viii. p. 244. Nov. 1870.

c Phil. Mag., vol. xxiv. pp. 481-4. June 1844. Pytheas of Marseilles, who flourished about 330 B.C., was the first to notice that the so-called Pole-star was not situated exactly at the Pole.

the lower culmination of α Draconis alone would be recognised by this arrangement, and thinking that something connected with an upper culmination should assuredly be looked for, finds that something in the Pleiades, which would at the epoch alluded to culminate above the Pole coincidently with α Draconis below; and he suggests moreover that the 7 chambers of the great pyramid commemorate the 7 Pleiads.

The stars, on account of their various degrees of brilliancy. have been distributed into classes or orders. Those which appear largest are called stars of the 1st magnitude; next to these come stars of the 2nd magnitude; and so on to the 6th. which are the smallest visible to the naked eye. This classification having been made long before the invention of telescopes, those stars which cannot be seen without the assistance of such instruments are called telescopic, and are classed in magnitudes varying from the 7th to the 18th or 20th; these latter, of course, being only visible in the most powerful instruments hitherto constructed; nor does it seem reasonable to assign a limit to this progressive diminution, inasmuch as past experience has shown that every successive improvement in the construction, of telescopes brings to light new objects, previously unknown because small and faint.

Some astronomers, when they wish to signify that a star occupies an intermediate place between 2 magnitudes, mark it thus:— 1·2: or thus:— 2·1. These dots are not intended to be decimal points, but mean that the star is below the 1st and above the 2nd magnitude; in the former case nearer the 1st than the 2nd, in the latter nearer the 2nd than the 1st. This is a very clumsy system, and its continuance is to be deprecated.

It may be worth while here to give a list of the stars of the Ist magnitude arranged as nearly as may be in the order of brightness:—

```
a Canis Majoris. (Sirius.)
a Argûs. (Canopus.)
```

a Centauri.

a Boötis. (Arcturus.)

β Orionis. (Rigel.)

a Aurigæ. (Capella.)

a Lyræ. (Vega.)

a Canis Minoris. (Procyon.)

a Orionis. (Betelguese.)

a Eridani. (Achernar.)

```
a Tauri. (Aldebaran.)

β Centauri.

a Crucis.

a Scorpii. (Antares.)

a Aquilæ. (Altair.)

a Virginis. (Spica.)

a Piscis Australis. (Fomalhaut.)

β Crucis.

β Geminorum. (Pollux.)

a Leonis. (Regulus.)
```

These stars—20 in number—will be found to be nearly equally divided between the Northern and Southern hemispheres, that is to say, 9 are Northern and 11 Southern stars.

Seidel d has submitted the following as standard stars for their respective magnitudes:—

a Aquilæ, a Virginis, a Orionis.
 a Ursæ Majoris, γ Cassiopeiæ, Algol (at max.).
 γ Lyræ, δ Herculis, θ Aquilæ.
 β Herculis, λ Draconis, (too bright).
 μ Boötis, θ Herculis, (too faint).

From the earliest ages of antiquity it has been the custom to arrange the stars in groups or constellations, for the purpose of more readily distinguishing them; each group having appropriated to it some special figure to which the configuration of its stars may be supposed to bear a resemblance, though, in the majority of instances, this resemblance is imaginary. Modern astronomers have continued this arrangement chiefly on account of the confusion that would arise were it now to be abandoned. We often find that one constellation contains an isolated portion of another, just as one English county sometimes wholly surrounds a parish belonging to another. Stars, too, often occur under different names e. Many catalogue-stars have no existence, but owe their creation to mistakes of observers. Constellations are recognised by some and not by others; while the same names are repeated in different parts of the heavens: such are a few of the anomalies of the present system f.

The constellations will again be referred to in a subsequent chapter.

Concerning the comparative brilliancy of the stars, we know little for certain. Sir W. Herschel gave the following table of

d Resultate, Munich, 1862.

Baily, in the Brit. Assoc. Cat. of duction to the B.A.C., p. 52 et seq.

Stars, p. 75, gives a list of some of these.

defent sign and

the light emitted by stars of different magnitudes, as deduced from his own observations, an average star of the 6th magnitude being taken as unity.

$$6^{\text{th}}$$
 magnitude = I 3^{rd} magnitude = I2 5^{th} , = 2 2^{nd} , = 25 4^{th} , = 6

Sir J. Herschel ascertained that the light of *Sirius* (the brightest of all the fixed stars) is about 324 times that of an average star of the 6th magnitude. From direct photometrical experiments, Dr. Wollaston found that the light of the Sun, as received by us, exceeded by 20,000,000,000 times that of Sirius; consequently, in order that the Sun might appear to us no brighter than Sirius, it must be removed from us not less than 13,433,000,000,000 miles—a distance utterly beyond the limits of human comprehension ^g.

The different degrees of brilliancy observable in the stars might be due to one or other of the following reasons:-Either (1) they are all of the same size, but situated at different distances; or (2) they are of different sizes, but at the same distances.* If we suppose the first to be the true hypothesis, and take the light of a star of each magnitude to be half that of the magnitude next above it, we find that the distance of a star of the 16th magnitude cannot be less than 362 times that of a star of the 1st magnitude h; and "as it has been considered probable from recondite investigations, that the average distance of a star of the 1st magnitude from the Earth is 986,000 radii of our annual orbit," it follows that a 16th-magnitude star is distant from us 32,634,292,000,000,000 miles—a distance which light, with a velocity of 186,660 miles per second, would occupy more than 5000 years in traversing! But calculations such as this may be pronounced valueless, for the simple reason that all analogy impels us to suppose that stars, like other celestial objects, are both of diverse size and situated at diverse distances.

different results. Further information on the brightness of particular stars will find a place in a later chapter. (See chap. VIII., post.)

s It must be pointed out that these experiments were made many years ago, and that the progress of science and the improved methods available for photometric purposes might now lead to very

h Sir J. Herschel.

The actual distances from the Sun of a few stars have however been ascertained.

The determination of the distance of the stars is effected by ascertaining by instrumental observations the amount of their annual parallax, or apparent displacement in the heavens. The non-detection of stellar parallax afforded for a long time a much resorted to, and certainly to some extent plausible, argument against the soundness of the Copernican theory of the universe. Since it happens that the stars, with few exceptions, do not exhibit parallax, and since also the fact of the orbital motion of the Earth round the Sun rests on the most undoubted evidence, it follows that the general absence of parallax can only be ascribed to the fact that the stars must be placed at such distances from us, that, comparatively speaking, the Earth's orbit, which has a diameter of 186,000,000 miles, is something utterly insignificant,—a mere point, when considered in reference to the distances of the stars themselves.

It might be supposed that since the character and laws of parallax are so clearly understood as they are, the discovery of its existence could present no great difficulty. Nevertheless, nothing in the whole range of astronomical research has more baffled the efforts of observers than this question. This has arisen altogether from the extreme minuteness of its amount. It is quite certain that the parallax does not amount to so much as I" in the case of any of the numerous stars which have been as yet submitted to the course of observation which is necessary to discover the parallax. Now, since in the determination of the exact uranographical position of a star there are a multitude of disturbing effects to be taken into account and eliminated, such as refraction, precession, nutation, aberration, and others, besides the proper motion of the star, which will be explained hereafter; and since, besides the errors of observation, the quantities of these influences are all subject to more or less uncertainty, it will astonish no one to be told that they may entail, upon the final result of the calculation, an error of I"; and, if they do this, it is vain to expect to discover

such a residual phenomenon as parallax, the entire amount of which is less than I".

An object, whatever be its size, subtends an angle of 1" when removed to a distance of 206,265 times its own dimensions.

If in any case the parallax could be determined, the distance of the star could be immediately inferred. For, if this value of the parallax be expressed in seconds, or in decimals of a second, and if r denote the semidiameter of the Earth's orbit, d the distance of the star, and p the parallax, we shall have—

$$d = r \times \frac{206265}{p}$$

If, therefore, p=1'', the distance of the star would be 206,265 times the distance of the Sun; and since it may be considered satisfactorily proved that no star which has ever yet been brought under observation has a parallax greater than this, it may be affirmed that the star in the universe nearest to the solar system is at a distance from it, at least, 206,265 times as great as that of the Earth from the Sun.

Let us consider more attentively the import of this conclusion. The distance of the Sun, expressed in round numbers (and this is sufficient for our present purpose), is 93 millions of miles. If this be multiplied by 206,265, we shall obtain,—not indeed the distance of the nearest of the fixed stars,—but the inferior limit of that distance, that is to say, a distance within which the star cannot lie. This limit, expressed in miles, is:—

 $d = 206, 265 \times 92, 890,000 = 19, 160,000,000,000$ miles,

or more than 19 billions of miles.

In the contemplation of such numbers the imagination is lost, and no clear conception remains, except that of the mere arithmetical expression of the result of the computation. Astronomers themselves, accustomed as they are to deal with stupendous numbers, are compelled to seek for units of proportionate magnitude to bring the arithmetical expression of the quantities within moderate limits. The motion of light supplies one of the most convenient moduli for this purpose, and has, by common

consent, been adopted as the unit in all computations the object of which is to gauge the universe. It is known that light moves at the rate of 186,660 miles per second. If, then, the distance d above computed be divided by 186,660, the quotient will be the time, expressed in seconds, which light takes to move over that distance. But since even this will be an unwieldy number, it may be reduced to minutes, hours, days, or even to years.

In this manner we find that, if any star have a parallax of 1", it must be at such a distance from our system that light would take 3.247 years, or 3 years and 90 days, to come from it to the Earth.

If then the space through which light moves in a year be taken as the unit of stellar distance, and p be the parallax expressed in seconds, or decimals of a second, we shall have

$$d = \frac{3 \cdot 247}{p}.$$

It will easily be imagined that astronomers have diligently directed their efforts to the discovery of some change of apparent position, however small, produced upon the stars by the Earth's motion. As the stars most likely to be affected by the motion of the Earth are those which are nearest to the system, and therefore probably those which are brightest and largest, it has been to such that this kind of observation has been chiefly directed; and since it was certain that, if any observable effect be produced by the Earth's motion at all, it must be extremely small, it is only from the nicest and most delicate means of observation that any discovery of this nature could be expected.

One of the earlier expedients adopted for the solution of this problem was the erection of a telescope, of great length and power, in a position permanently fixed—attached, for example, to the side of a pier of solid masonry, erected upon a foundation of rock. This instrument was screwed into such a position that particular stars, as they crossed the meridian, would necessarily pass within its field of view. Micrometric wires were, in the usual manner, placed in its eye-piece, so that the exact point

at which the stars passed the meridian each night could be observed and recorded with the greatest precision. The instrument being thus fixed and immoveable, the transits of the stars were noted each night, and a record was made of the exact places where they passed the meridian. This kind of observation was carried on through the year; and if the Earth's change of position, by reason of its annual motion, should produce any effect upon the apparent position of the stars, it was anticipated that such effect would be discovered by these means. After, however, making all allowance for the usual causes which affect the apparent position of the stars, no change of position was discovered which could be assigned to the Earth's motion. A tube of this kind was used at Greenwich by Pond.

Only a few stars are certainly known to possess a sensible parallax. Particulars of some of them are given in the table on p. 10, which has been calculated on the assumption that the Sun's parallax = 8.80, and that the velocity of light = 186,660 miles per second.

Stars are distinguished from one another in various ways. The ancients were in the habit of indicating the locality of a star by its position in the constellation to which it belonged; thus Aldebaran was called Oculus Tauri. This custom was also followed by the Arabians, and, indeed, many of the names applied by them are still retained in a corrupted form; thus Betelgueze (a Orionis) is a corruption of ibt-al-jauza, signifying "the shoulder of the Jauza (or 'Central one')." Bayer, the German astronomer, was the first to improve upon the old plan, which he did by publishing in 1603 a celestial atlas, in which the stars of each constellation were distinguished by the letters of the Greek alphabet; but the common supposition that the brightest received the distinctive mark of a, the next β , and so on, is only in some degree correct, except as regards the a's. Bayer's letters are still in common use, the name of the constellation in the genitive case being put after each; thus Procyon

¹ The preceding remarks on stellar parallax are taken (with slight alterations) from the Museum of Science.

is termed a Canis Minoris; Vega, a Lyræ; Arcturus, a Boötis. It should be understood that this alphabetical arrangement does not represent the relative brilliancy of the different stars in a constellation. To the stars observed by Flamsteed numbers were affixed by Baily, which numbers, referring to the order of R. A. in each constellation, are still in use.

				Distance.		
Star.	Mag.	Proper Motion.	Parallax.	Sun's distance = 1.	Time of its light reaching the Earth.	Observer.
a Centauri	1	3.67	0.75	275,000	years.	Gill.
61 Cygni	6	5.14	0.50	412,500	6.51	O. Struve.
21185 Lalande	71	4.75	0.50	412,500	6.51	Winnecke.
Sirius	1	1.24	0.38	543,000	8.57	Gill.
μ Cassiopeiæ			0.34	606,000	9.57	O. Struve.
34 Groombridge	8	2.81	0.29	711,000	11.23	Auwers.
9352 Lacaille	$7\frac{1}{2}$	6.95	0.28	737,600	11.62	Gill.
21258 Lalande	81/2	4.40	0.26	793,000	12.52	Krüger.
Ö. Arg. 17415	9	1.27	0125	825,000	13.02	Kriiger.
σ Draconis	5	1.87	0.25	825,000	13.02	Brunnow.
ε Indi	51	4.68	0.22	938,000	14.80	Gill.
a Lyræ	1	0.31	0.20	1,031,000	16.27	
o² Eridani	$4\frac{1}{2}$	4.10	0.17	1,213,000	19.15	Gill.
ρ Ophiuchi	$4\frac{1}{2}$	1.00	0.17	1,213,000	19.15	Krüger.
€ Eridani	41/2	3.03	0.14	1,473,000	23.24	Elkin.
ι Ursæ Majoris	3	0.52	0.13	1,586,000	25.04	C.A. F. Peters.
a Boötis	I	2.43	ð·13	1,586,600	25.04	C. A. F. Peters.
γ Draconis	2	0.06	0.09	2,292,000	36.17	
1830 Groombridge	7	7.05	0.09	2,292 000	36.17	Brunnow.
Polaris	2		0.07	2,947,000	46.50	C.A. F. Peters.
3077 Bradley	6	2.09	0.07	2,947,000	46. 0	Brunnow.
ζ Toucani	6	2.05	0.06	3,438,000	54.25	Elkin.
85 Pegasi	6	1.38	0.05	4,125,000	65.10	Brunnow.
a Aurigæ	I	0.43	0.04	5,157,000	81.37	C.A.F. Peters.
Canopus	1		0.03	6,875,000	108-50	Elkin.

The subject of the photometry of stars, though one of much importance, has received but little attention from practical astronomers. The common method of classifying stars into arbitrary magnitudes is both vague in theory and contradictory in practice. It is vague, inasmuch as the place of a star in the scale of magnitudes conveys but little definite idea of the actual brilliancy thereof; and it is contradictory in a remarkable degree, inasmuch as the same star has in numberless instances a different magnitude assigned to it by different authorities k.

The first observer who attempted stellar photometry on any organised basis was Sir J. Herschel, who formed a Table of Stars arranged in order of brightness. In Germany the subject has received a good deal of attention, especially from Heis, Seidel, and Zöllner. The most recent workers in this field are Pickering in America, and Pritchard in England and Egypt.

Seidel has published an elaborate catalogue of 206 conspicuous stars arranged progressively in the order of brightness as determined (I believe) by an "astro-photometer" invented by Steinheil. The following are the first 20 stars in Seidel's list, with the relative values assigned by him to each ":—

a Leonis 0.325
α Cygni ο-310
€ Canis Majoris 0.309
a Tauri 0.303
a Scorpii 0.291
β Geminorum 0.289
a Geminorum 0.256
7 Orionis 0.255
β Tauri 0.229
ζ Orionis 0.220

It will be seen that Seidel gives the second place to a Lyræ, but Pickering and Monck allot that place to a Aurigæ, whilst Pritchard gives it to β Orionis.

k Sir J. Herschel, Results of Ast. Obs., p. 304. See remarks by Pogson in Radcliffe Obs., vol. xv. p. 295. 1854.

¹ Outlines of Ast., p. 705.

m Seidel's Table, together with that of

Zöllner, will be found in Klein's Handbuch der Fixsternhimmel, p. 26. See a Paper by L. Seidel in Abhandlungen der K. Bayr. Akademie der Wissenschaften, 6th class, vol. iii. 1852.

The labours of Pickering at Harvard College Observatory have resulted in the publication of a very valuable catalogue of 4260 stars whose magnitudes have been determined on definite and intelligible principles. In friendly competition with this work stands Professor Pritchard's Book recording his results obtained partly at the University Observatory, Oxford, and partly in Egypt.

The Harvard Photometry and the Uranometria Nova Oxoniensis are both intended to arrange the stars according to magnitude on the assumption that the light of a star of the nth magnitude is to that of a star of the n + 1th magnitude in the ratio of 2.512 to 1. The logarithm of 2.512 is 0.4, so that a difference of 2½ magnitudes on this scale corresponds to an increase or diminution of the light in the ratio of 10 to 1. Both authors adopt the Pole Star as their standard, and as the other stars are compared with it when at nearly the same altitude, the figures which express the relative magnitudes will be the same, whether the Zenithal or the actual value of the Pole Star's light is assumed as the standard. Pickering however rates the Pole Star as of the magnitude 2.15, while Pritchard put it at 2.05. Pickering is of opinion that this difference of standard is rather apparent than real-in other words, that the Pole Star appeared about one-tenth of a magnitude brighter to the Oxford observers than to those at Harvard. According to both, the Star which may be regarded as the typical 1st magnitude star is a Aquilæ (Altair). Its Oxford magnitude is 1.04, and its Harvard magnitude 0.97. Other stars which approach closely to this type are a Virginis (Spica), a Tauri (Aldebaran), a Scorpii (Antares), and a Orionis (Betelgueze), the variability of the last-named however interfering with its use as a type. Taking a mean between the Oxford and the Harvard results, the light of the 4 following stars is almost exactly equal, and about 5 of a magnitude above the first magnitude, viz. B Orionis (Rigel), a Boötis (Arcturus), a Lyræ (Vega), and a Aurigæ (Capella). Procyon is about half a magnitude above the 1st magnitude, while Sirius is 1.95 magnitudes above it according to Oxford, and 2.43 according to Harvard. Owing to their great

Southern declinations, Canopus and α Centauri do not appear in either list. The Harvard catalogue terminates at about the 30th degree of South Declination, and the Oxford one at about the 10th degree.

Monck, who has studied both catalogues, is of opinion from a comparison of the stars whose magnitude approaches that of the Pole Star that there is a real difference in Scale between them, but that the amount would be better represented by 0.06 or 0.07 than by 0.10 of a magnitude. Pickering however has shown that any difference which may exist at this point soon disappears, and that between the 5th and 6th magnitudes the stars are as a rule fainter according to the Oxford measurements without any correction for scale. Monck has arrived at the same conclusion, but finds the stars on an average brighter according to the Uranometria Nova Oxoniensis up to about magnitude 4.25, from which to 4.50 the scales may be regarded as coincident, after which the Oxford values are lower than the Harvard, the difference reaching 0.08 at about magnitude 6.0. Pickering, taking the stars rated at Harvard at between 6.0 and 7.0 and comparing the Oxford values for the same stars, finds the latter brighter: but Monck, who took those rated at Oxford at between 6.0 and 7.0 and compared them with the corresponding Harvard values, arrived at a different result. As neither catalogue professes to be complete within these limits, further observations with the Meridian and Wedge Photometers are necessary to decide the question; but from the 2nd to the 6th magnitudes it would appear that a magnitude as estimated by the Wedge Photometer corresponds to about 0.96 or 0.97 of a magnitude as measured by the Meridian Photometer.

These catalogues are intended to be complete (within the limits of Declination already mentioned) up to about the 6th magnitude. Monck thinks they are probably defective below 5.80. According to him the number of stars of each magnitude

in the catalogues is as follows:-

Magnitude.	N	o of Stars. Harvard.	No. of Stars. Oxford.
Above the 1st	 	9	8
1.0 to 1.5	 	7	6
1.5 to 2.0	 	11	11
2.0 to 2.5	 	30	28
2.5 to 3.0	 	41	21
3.0 to 3.5	 	81	59
3.5 to 4.0	 	148	102
4.0 to 4.5	 2	264	165
4.5 to 5.0	 	477	292
5.0 to 5.5	 	845	615
5.5 to 6.0	 	1273	918

Monck thinks that the figures in the last subdivision are probably defective. It may be worth noticing that on the assumption of uniform arrangement and equal absolute brightness the number of stars comprised in any half-magnitude should, in round numbers, be double that comprised in the preceding half-magnitude and equal to the entire number of brighter stars. The departures from this law (to which there is nevertheless a certain degree of approximation) will be evident on examining the foregoing table.

The Bonn Durchmusterung, with Schönfeld's Southern extension, taken together embrace nearly the same portion of the sky as the Harvard Photometry, and Seeliger has given a summary of the number of stars for fainter magnitudes. It should be noted however that it is still uncertain whether the ratio of 2.512 to 1 is applicable to the fainter magnitudes in these catalogues. Seeliger's table, the stars below the 9th magnitude being omitted, is as follows:—

	Magnitudes.			N	o. of Stars.
Above magnitude	6.5			 	5385
"	6.5 to 7.0			 	5163
,,	7.0 to 7.5			 	7882
,,	7.5 to 8.0			 	14674
,, in	8.0 to 8.5	W		 	30499
,,	8.5 to 9.0		P	 •••	71485

Traces of the law just suggested, but with similar fluctuations, will here be observed. It is certain however that the law cannot hold even approximately true as regards extremely distant stars, since if it did so the total light of the stars of the n + 1th magnitude

would always exceed the total light of the stars of the n^{th} magnitude, and the total light of all the stars would be infinitely greater than that of the stars comprised in any given subdivision.

The practice of giving names to the stars is of early date, and probably originated with the Chaldeans. Intimations of this custom may be found in the Holy Scriptures. I cite the following passages from the Revised Version:—

"Which maketh the Bear, Orion, and the Pleiades, and the chambers of the south "."

"Canst thou bind the cluster of the Pleiades, or loose the bands of Orion? Canst thou lead forth the Mazzaroth in their season? Or canst thou guide the Bear with her train o?"

"Seek him that maketh the Pleiades and Orion P."

The invention of the Zodiac has been ascribed to the Egyptians^q. Dupuis especially advocated this opinion, and thought that the constellations in question had reference to the division of the seasons, and to the agriculture in vogue at the time of their invention. He supposed Cancer to represent the retrogradation of the Sun at the solstice, and Libra the equality of the day and night at the equinoxes. This idea is undoubtedly supported by several curious coincidences: for instance, the inundation of the Nile, which takes place after the summer solstice, happens when the Sun is in Aquarius and Pisces; and Virgo, usually represented as a woman holding an ear of corn, coincides with the time of the Egyptian harvest.

The insuperable objection to this theory is the excessive

n Joh, ix. 9.

o Job, xxxviii. 31-2.

P Amos, v. 8. Some of the renderings given in the A.V. rest on insufficient authority. It is probable that Mazzaroth means the circle of the zodiac (as indeed the Revisers of 1885 have hinted at by their use of this interpretation in the margin of their Version), but the others are more doubtful. Parkhurst (Lexicon) thinks that the application of the Greek names of certain constellations to the Hebrew originals, as is done in the Authorised Version here and elsewhere, and by the LXX previously, is only fanciful.

Barnes (Notes on Job ix. 9) derives Kimah (translated above by "Pleiades") from a root signifying a heap, and so applicable to the Pleiades; and Kesil (translated above by "Orion") from another root signifying to be strong, and thus applicable to that constellation known as the strong man, corresponding, as may be conjectured, to what the Greeks called Orion. (See Class. Dict.) Apparently the Revisers have followed the line of thought suggested by Barnes.

4 An engraving of the well-known Zodiac at Denderah will be found in L'Astronomie, vol. vii. p. 344, Sept. 1888. antiquity which it assigns to the Zodiac (not less than 15,000 years). As this is historically inadmissible, and directly opposed to Divine Revelation, Dupuis got over the difficulty by supposing the names to have been given, not to the constellations in conjunction, but to those in opposition to the Sun. This only requires the constellations to have been devised B.C. $2500 \pm ;$ in this form the idea is adopted by Laplace and others as correct. It has been suggested that the Jews were acquainted with the Zodiac, and that in Gen. i. 14 the uses of the heavenly bodies—to divide the seasons, years, and days—are intended to be set forth.

The way in which the sky was portioned off by the ancients into 12 equal divisions to form the signs of the Zodiac is stated to have been as follows:—"They took a vessel with a small hole in the bottom, and allowed water to drop slowly through it into another placed beneath, from the time one star rose until its rising on the following night. The water thus caught was then divided equally into twelve parts, and poured once more into the strainer. As each twelfth part finished dropping through, they observed what star was rising in the quarter of the heavens where lay the Sun's path, and gave it and its constellation a name, generally that of some animal."

Seneca attributes the subdivision of the heavens into constellations to the Greeks, 1400 or 1500 years B.C.⁸ It may be mentioned as a somewhat singular fact, that the Iroquois, a North American Indian tribe, should have applied the name of "The Bear" to the group Ursa Major, in common with the earliest Asiatic nations, so remote from them, more especially as it cannot be said to offer much resemblance to that or any other animal.

The present system of constellations, though on the whole useful, presents many anomalies, which require reform. Thus Aries should no longer have a horn in Pisces and a leg in Cetus; nor should 13 Argûs pass through the flank of Monoceros into Canis Minor: 51 Camelopardi might with propriety be extracted from the eye of Auriga; and the ribs of Aquarius released from

r Hist. of Ast., L.U.K., p. 16.

⁸ Quæst. Nat., lib. vii. cap. 25.



46 Capricorni. But these are all matters as to which it is probably hopeless (and perhaps not even desirable) to expect extensive improvements in the present day. The subject of the constellations is however one of such importance that an entire chapter must be devoted to it. (See Chap. VII., post.)

With reference to the present mode of identifying stars by letters, it may be remarked that though the idea was carried out practically by Bayer ^t, as mentioned above, yet Piccolomini, who was born at Siena in 1508 and died there in 1578, did something of the same kind of thing when he applied Roman letters to a few stars. The letter system is defective in this respect, that in large constellations the alphabet is very soon used up: indeed, as Baily remarked, La Caille has, in the constellation Argo alone, besides the Greek alphabet, employed the whole of the Roman alphabet, both in small and capital letters, each of them more than 3 times; in fact he has used nearly 180 letters in that constellation alone. "Thus we have 3 stars marked a, and 7 marked A; 6 marked d, and 5 marked D; and so on with several others."

As increased attention came to be paid to the study of the heavens, the number of enumerated stars was, as might be expected, augmented. The following table u exemplifies this.

	Ptolemy.	Tycho Brahe.	Hevelius.	Flamsteed.	Bode.
Aries	18	21	27	66	148
Ursa Major	35	56	73	87	338
Boötes	23	28	52	54	319
Leo	35	40	50	95	337
Virgo	32	39	50	110	411
Taurus	. 44	43	51	141	394
Orion	38	62	62	78	304

^t Bayer was likewise an astrologer. In the 1st edition of the *Uranometria* he marked many objects supposed to have

some influence over mundane affairs.

u A fuller one will be found in the Encycl. Met., art. "Astronomy," p. 506.

It shows the number of stars reckoned in certain constellations by 5 different catalogue-makers living at different epochs.

Figs. 3 and 4 will illustrate this more clearly than any verbal description. The latter is a reproduction of one of Argelander's

Fig. 3.



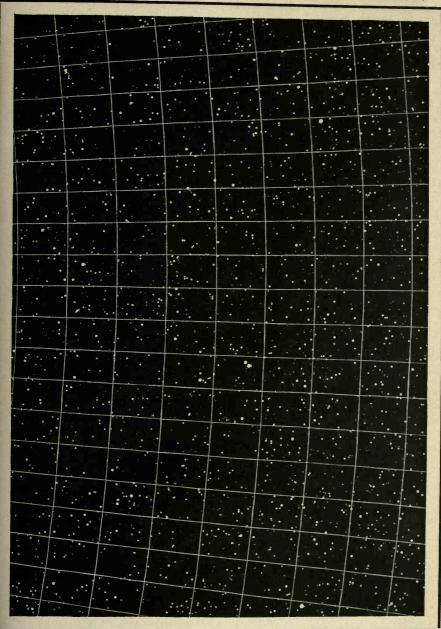
A NAKED-EYE VIEW OF THE HEAVENS CORRESPONDING TO ONE OF ARGELANDER'S CHARTS. (Flammarion.)

Maps representing the identical portion of the heavens, of which Fig. 3 is a naked-eye view.

The ideas of the ancients on the fixed stars were very obscure. Anaximenes (550 B.C.) thought that the stars were designed for ornament, and nailed, as it were, like studs in the crystalline sphere. Pythagoras pronounced each star to be a distinct world with its own land, water, and air. The Stoics, Epicureans, and indeed almost all the ancient schools of philosophy, held that the stars were celestial fires nourished by the caloric or igneous

matter which they believed streamed out perpetually from the centre of the universe. Anaxagoras (450 B.C.) considered that the stars were stones whirled upwards from the Earth by the rapid motions of the ambient ether, the inflammable properties of which setting them on fire caused them to appear as stars. Callimachus describes the circumpolar stars as feeding on air; and Lucretius, pondering on the subject, and not doubting the fact, asks "Unde æther sidera pascit?" (How does the æther nourish the stars?) Stars were at one time looked upon as the spiraculæ, or breathing-holes of the universe.

Sir John Herschel's remarks on the stars are very forcible. He says: "The stars are the land-marks of the universe; and amidst the endless and complicated fluctuations of our system, seem placed by its Creator as guides and records, not merely to elevate our minds by the contemplation of what is vast, but to teach us to direct our actions by reference to what is immutable in His works. It is indeed hardly possible to over-appreciate their value in this



TELESCOPIC VIEW OF THE SKY

Corresponding to the area exhibited in Fig. 3 (opposite).



point of view. Every well-determined star, from the moment its place is registered, becomes to the astronomer, the geographer, the navigator, the surveyor, a point of departure which can never deceive or fail him, the same for ever and in all places, of a delicacy so extreme as to be a test for every instrument yet invented by man, yet equally adapted for the most ordinary purposes; as available for regulating a town clock as for conducting a navy to the Indies; as effective for mapping down the intricacies of a petty barony as for adjusting the boundaries of transatlantic empires. When once its place has been thoroughly ascertained and carefully recorded, the brazen circle, on which that useful work was done, may moulder, the marble pillar totter on its base, and the astronomer himself survive only in the gratitude of his posterity: but the record remains, and transfuses all its own exactness into every determination which takes it for a groundwork, giving to inferior instruments, nay, even to temporary contrivances, and to the observations of a few weeks or days, all the precision attained originally at the cost of so much time, labour, and expense x."

Some investigations have been made by Stone having for their object the determination of the question whether the stars transmit to us any measureable amount of heat. The investigations alluded to were carried out at the Greenwich Observatory in 1869 by the aid of a thermo-electric pile connected with the great 12\frac{3}{4}-inch refractor of that Observatory, and are thought to have yielded some sensibly affirmative results \(^y\). In the case of Arcturus it was found (or supposed) that when at an altitude of 25° that star gave out just so much heat as was equal to the heat received from a 3-inch cube of boiling water at a distance of 400 yards. Some experiments by Huggins led him to a similar conclusion \(^z\). Yet for all this one cannot but be a little sceptical, at least as to the measurability of star heat.

To the naked eye the stars appear to preserve the same positions

^{*} Mem. R.A.S., vol. iii. p. 125. 1829. ** ** Ast. Reg., vol. vii. p. 85. April Jan. 1870; ** Phil. Mag., 4th ser., vol. 1869.

relatively to one another from year to year, and hence they have been called the fixed stars; but, as I have already mentioned, this is not strictly true with many stars, for careful observations show that they are endued with a proper motion of their own through space. Inasmuch, however, as in no case does this proper motion exceed a few seconds per annum, there is no essential impropriety in retaining the designation "fixed stars," or, as Sir John Herschel put it, "Motions which require whole centuries to accumulate before they produce changes of arrangement such as the naked eye can detect, though quite sufficient to destroy that idea of mathematical fixity which precludes speculation, are yet too trifling, as far as practical applications go, to induce a change of language, and lead us to speak of the stars in common parlance as otherwise than fixed. Small as they are, however, astronomers, once assured of their reality, have not been wanting in attempts to explain and reduce them to general laws."

C. P. Smyth, from an investigation of the history of the star 793 B. A. C. Ceti, appears to believe in the existence of such a thing as periodical proper motion, that is to say, that the amount of a star's proper motion may vary by cycles a. If this idea should turn out to be, to any considerable extent, well founded, interesting discoveries may be looked for at some future time in this branch of sidereal astronomy, but at any rate, so far as regards this particular star, Smyth's views are without support from other authorities on star-places b.

The researches of astronomers during the last quarter of a century in particular have led to the discovery of the fact that a very large number of stars are affected by proper motion.

Amongst the stars whose annual proper motion is considerable may be mentioned c:—

^a Month. Not., vol. xxxv. p. 356. May 1875.

Dunkin, Month. Not., vol. xxxvi. p. 254; Stone, Month. Not., vol. xxxvi. p. 257, March 1876.

^c See papers by Lynn, Month. Not., vol. xxx. p. 703, June 1870; vol. xxxiii. p. 103, Dec. 1873; and a much older one by Baily in Mem. R.A.S., vol. v. p. 158, 1833.

Star's Name.	Mag.	R.	A. 18	90.	Decl.	Annual Motion in great circle.
1830 Groom. Ursæ Majoris	7	h.	m. 46	s. 32	+ 38 32.2	7.03
9352 Lacaille Piscis Australis 1534 XXIII Cordoba Sculptoris	7	22	58	39	-36 29.5	6.96
61 Cygni $\frac{A+B}{2}$.	5, 6	21	1	57	+ 38 12.5	5.12
21185 Lalande		10	57		+ 36 50.1	4.69
21258 Lalande o² Eridani	8	11	0	40 12	+44 4.1	4.37
μ Cassiopeiæ	$5\frac{1}{2}$		0		+ 54 22.8	3.19
α Centauri $\frac{A+B}{2}$.	I, 2	14	32	7	-60 23.0	3.64

The first astronomer to whom the idea of a proper motion of the stars presented itself was Halley. Comparing the ancient places of the 3 important stars Sirius, Arcturus, and Aldebaran, with his own places determined in 1717, and making every allowance for variation in the obliquity of the ecliptic, he found discordances in latitude amounting to 37', 42', and 33' respectively. Thus he arrived at his surmise as to the existence of proper motion: scientific proof had yet to follow. This was obtained in 1738 by James Cassini, who ascertained that Arcturus had suffered a displacement of 5' in 152 years, whilst the neighbouring star η Boötis had not been similarly or at all affected. Cassini further discovered the existence of proper motion in longitude, and it was remarked by Fontenelle, "There is a star in the Eagle (a) which, if all things continue their present course, will, after the lapse of a great number of ages, have to the West another star which at present appears to the East of it."

The existence of stellar proper motion being beyond question, it was a natural step forward to seek to determine what it involved. Sir W. Herschel entered upon an inquiry in 1783, and by carefully classifying all the proper motions then known he was led to infer that the solar system was moving towards a point indicated by R.A. 17^h 8^m, Decl. + 25°. This point is near

the star A Herculis. To review all that has been done in this department of physical astronomy would demand more space than it would be convenient for me to give d: suffice it, therefore, to say that several recent calculators, employing a considerable number of stars, both Northern and Southern, have one and all confirmed not only Sir W. Herschel's general deduction, but likewise his conclusion as to the precise point, to within a very few degrees of arc; or in the words of W. Struve (after a careful examination of the researches of MM. Argelander, O. Struve, and C. A. F. Peters): "The motion of the solar system in space is directed to a point in the celestial sphere situated on the right line which joins the 2 stars of the 3rd magnitude π and μ Herculis, at 1/4 of the apparent distance between these stars measured from \u03c4 Herculis. The velocity of the motion is such that the Sun, with the whole cortége of bodies depending on him, advances annually in the direction indicated, through a space equal to 1.623 radii of the terrestrial orbite. The most recent result, and probably also the most trustworthy, having regard to the large number of stars on which it depends, is L. Struve's. He finds:—R.A. 18h 13m; Decl. + 27° as the point of convergence.

Spectroscopic observations by Huggins, of an ingenious but elaborate character, confirm the main features of these conclusions f.

As connected with the matter which has just been discussed, a passing allusion must be made to the Central Sun hypothesis, first started by Wright in 1750, and revived by Mädler in 18468. This theory simply supposes the existence of some central point around which the Sun, with its vast attendant cortége of planets and comets, revolves in the course of millions of years. Mädler thought he had sufficient ground for believing that this point is situated in or near the Pleiades, or, more exactly, at the star Alcyone (η Tauri). Grant very sensibly remarks: "It is manifest that all such speculations are far in advance of

d See Grant's Hist. Phys. Ast., p. 555 1872; Proc. Roy. Soc., vol. xx. p. 386, et seq.

e Etudes d'Ast. Stell., p. 108.

5 In his Die Centralsonne, 4to. Dorpat.

5 See Ast. Reg., vol. x. p. 165, July 1846.

practical astronomy, and therefore they must be regarded as premature, however probable the supposition on which they are based, or however skilfully they may be connected with the actual observation of astronomers." Vague ideas of the motion of the solar system around some common centre are to be found in Lucretius h: it was thought that but for such motion all celestial objects must have collapsed and formed a chaos.

There are some stars which Sir W. Herschel was disposed to consider to be in a great measure out of the reach of the attractive force of other stars, and as probable centres of extensive systems like our own. Among them he suggested:—

Vega (α Lyræ).
Capella (α Aurigæ).
Arcturus (α Boötis).
Sirius (α Canis Majoris).
Canopus (α Argūs).
Markab (α Pegasi).

Bellatrix (γ Orionis). Menkab (α Ceti). Schedir (α Cassiopeiæ). Algorab (δ Corvi). Propus (I Geminorum).

The twinkling, or scintillation i, of the stars is a phenomenon which requires to be briefly noticed. The effect is too well known to need description, but the cause is involved in much obscurity, though it is referred by most observers to the interference of light k. Many ascribe it more immediately to the varying refrangibility of the atmosphere, and this latter theory has much to recommend it. Twinkling differs very much on different nights. Bright stars twinkle much more than faint ones; and indeed the faintest of the stars visible to the naked eye seem not to twinkle at all.

A quiescent condition of the air is unfavourable to the manifestation of twinkling. And in general the phenomenon is more marked with stars near the horizon (and therefore seen through dense strata of air) than with stars near the zenith; and at the surface of the Earth than in mountainous districts at high elevations where the air is more rarefied—all of which facts point out the atmosphere as an influential agent. In confirmation of

h De Rer. Nat., lib. i.

i Scintilla, a spark of fire. It is only stars that twinkle; the planets as a rule do not exhibit the phenomenon; but Venus

sometimes and Mercury more often are exceptions to this rule.

k Eng. Cycl., Arts and Sciences Div., art. Twinkling.

this is Humboldt's statement that in the pure air of Cumana twinkling ceased after the stars attained an elevation of 15° above the horizon. Dunkin gives the useful caution that "This law of twinkling, according to the altitude of the object, is not however universal, for several of the principal fixed stars, on account of the nature and peculiarity of their own light, vary considerably in the intensity of their scintillations independently of their position in the heavens. Procyon and Arcturus are known to twinkle much less than Vega, the brilliant bluish-white star in Lyra 1." According to Dufour, red stars twinkle less than white ones m, and twilight appears to intensify the twinkling. Liandier, from repeated observation, says that he is convinced that twinkling is due to disturbances of the atmosphere, brought about by winds and currents of air. The greater the twinkling, the easier it is to see faint stars ".

Regarded as a subject for exact observation twinkling appears only to have been systematically studied of late years by one man, Montigny of Brussels. But he has accumulated a large number of extremely interesting and curious facts. Some of these may be here stated in very condensed language. Twinkling goes on much more vigorously in rainy weather than at other times; in winter than in summer whatever be the weather. In dry weather in spring and autumn it is about the same, but wet has more effect in autumn than in spring in developing the phenomenon. Variations of pressure and humidity also affect the amount of twinkling; there is more when a rainy period likely to last 2 or 3 days is approaching than merely before a single casual rainy day: it also varies with the aggregate total rainfall of any group of days, being greater as the rainfall is greater, decreasing suddenly and considerably directly the rain has

1857.

But the most exhaustive account of Twinkling hitherto published is in the form of a Lecture by Ledger (Observatory, vol. i. pp. 44 and 82, May, June, 1877). C. Montigny of Brussels has written several interesting papers on the subject which have been read before the Belgian Académie royale.

¹ The Midnight Sky, p. 191. ^m Month. Not., vol. xviii. p. 51. Dec.

n A summary of some interesting spectroscopic observations of Twinkling Stars made by Respighi will be found in Month. Not., vol. xxxii. p. 173, Feb. 1872, and should be consulted by the curious reader.

passed away. The number of scintillations observable per second varies from a minimum of 50 during June to July to 97 in January and 101 in February, increasing and decreasing month by month in perfectly regular sequence. The Aurora Borealis has a marked effect in increasing the twinkling.

Even the foregoing highly epitomised statement is far from exhausting the striking facts ascertained by Montigny. He bethought him that possibly Secchi's 4 classes of stars (so classed according to their spectra °) might yield some definite results in the matter of twinkling, and he was not disappointed. From 225 observations of 16 stars belonging to Class I; 227 of 14 belonging to Class II; and 159 of 11 belonging to Class III, choosing for the most part stars larger than the 3rd magnitude, he obtained the following result:—

				ge Number of ions per Secon	d.
1st Class of Stars	 			86	
2nd Class of Stars	 		W	69	
3rd Class of Stars	 	1000		56	

He also found that the more perfectly any star possesses the distinguishing characteristics of its class the more nearly does the number of its scintillations agree with what is evidently the law indicated by the above table. This law may be stated thus: The more the spectrum of a star is interrupted by dark lines the less frequent are its scintillations. The individual character of the light emitted by each star appears therefore to affect its twinkling both as regards its frequency and the colours displayed. Montigny's explanation of this is simple and convincing, but it belongs rather to physics or spectroscopy than to astronomy.

Plate I is a reproduction by the French process of héliogravure, without any touching up by hand, of a photograph of a portion of the constellation Cassiopeia (R.A. oh 22^m; Decl. +61° o') taken at the Paris Observatory on November 6, 1886.

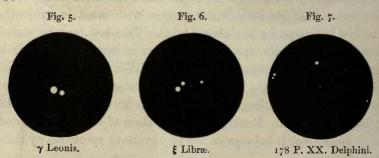
o See vol. ii. p. 354, ante.

CHAPTER II.

DOUBLE STARS, ETC.

But few known until Sir W. Herschel commenced his search for them.—Labours of Sir J. Herschel and F. G. W. Struve.—Examples.—Optical Double Stars.—Binary Stars.—Discovered by Sir W. Herschel.—Examples.—List of Optical Doubles.—Coloured Stars.—Examples.—Generalisations from Struve's Catalogue.—Conclusions drawn by Niesten.—Stars changing colour.—Triple Stars.—Quadruple Stars.—Multiple Stars.

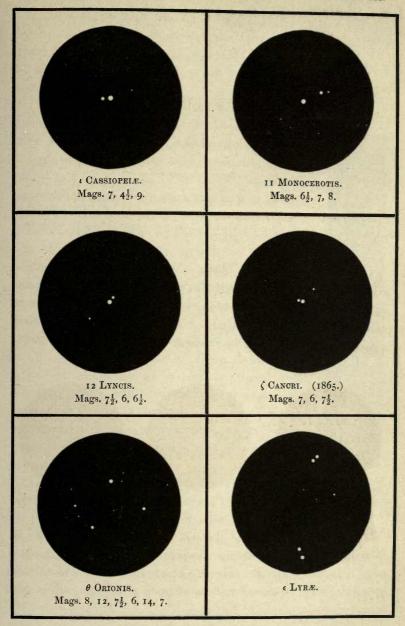
ALTHOUGH to the unaided eye all the stars appear single, yet in numerous instances the application of suitable optical assistance shows that many consist in reality of 2 stars, placed in apparent juxtaposition so close together that they appear to the unassisted eye as one. These are termed double



DOUBLE, TRIPLE, AND QUADRUPLE STARS.

stars. Only 4 of these objects were known until Sir W. Herschel, by means of his powerful telescopes, discovered a large number the existence of which had never before been suspected. He observed and catalogued altogether about 500, which subsequent observers, especially F. G. W. Struve and Sir J. Herschel, have augmented to nearly 10,000.

The first application of this term was by Ptolemy, who called ν Sagittarii, διπλοῦς.



MULTIPLE STARS.

(Drawn to scale by G. F. Chambers.)

Scale = 30" to the inch (except ϵ Lyræ). The Magnitudes are noted from left to right.

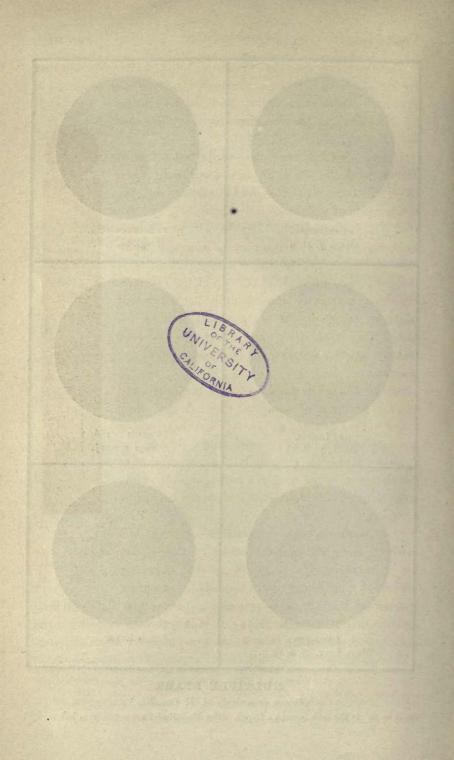


Fig. 14.

The following stars (see Table on p. 32) have been selected by Sir J. Herschel^b from Struve's Catalogue as remarkable

examples of each class, well adapted for observation by amateurs who may be disposed to try by them the efficiency of telescopes.

If two stars lie very nearly in the same line of vision, whatever their distance from each other. they will form an optical double star, or one the components of which are only apparently and not really in juxtaposition. Fig. 14 will enable this to be understood. Two stars may appear to be in close contiguity as in the circle, representing a telescopic field of view, at the top of the diagram. But this contiguity may simply be the result of their being in the same visual line at the same time that they are absolutely a long distance apart, as shown in the lower part of the diagram.

Sir W. Herschel, thinking that a prolonged and careful scrutiny of some of these double stars (mere optical doubles as he regarded them) might ultimately afford data for determining their parallax, applied himself in 1779 and subsequent years to the formation of an extensive catalogue, embodying measurements of position and distance for future reference.

"On resuming the subject his attention was diverted from the original object of the inquiry DISTANCES SEEN by phenomena of a very unexpected character, "DOUBLE STAR." which at once engrossed his whole attention.

TWO STARS AT DIFFERENT

Instead of finding, as he expected, that annual fluctuation to and fro of one component of a double star with respect to the other-that alternate increase and decrease of their distance

b Outlines of Ast., p. 609, kindly revised by Dawes for this work. But that able observer once told me that he at-

tached no great importance to such lists so far as regards the testing of telescopes.

				1		
o' to i". Ma	gs. 1" to 2".	Mags.	2" to 4".	Mags.	4" to 8".	Mags.
R.A.	R.A.	A Sal	R.A.		R.A.	
h. m. λ Cass o 25 6 -	61 36 Androm. 0 49	6 -7	h. m. a Piscium 1 56	3 -4	h. m. η Cassiop o 42	4 -73
		5 -61	e Trianguli 1 56	51-15	ι Cassiop 2 20	4 /2
		52-72		51-7		
		6 -6}			7	5 -7
The state of the s		M 31		3 -6		5
32 Orionis 5 24 5 —		6 -7		31-8	ω Aurigæ 4 51	5 -9
ω Leonis 9 22 6 -		6 -61	κ Leporis 5 8	5 -9	λ Orionis 5 29	4 6
φ Ursæ 9 44 5 —		6 -61	Corionis 5 35	3 -61	δ Geminor. 7 13	32-9
42 Comæ 13 4 5 —		44	e Hydræ 8 40	4 -81	a Geminor. 7 27	3 -31
ζ Boötis 14 35 3½-			γ Leonis 10 13		v Argûs 9 44	3 -8
π Lupi 14 57 5½-		42-5	ξ Ursæ Maj. 11 12	4 -5 }	a Crucis 12 20	12-2
η Coronæ B 15 18 5 —		4 -6	Leonis 11 18	4 —8	γ Virginis 12 36	4 -4
γ Lupi 15 27 4 —	4 S Herculis 16 37	3 -7	β Hydræ 11 46	5 —5	π Boötis 14 35	31-6
γ Coronæ B 15 38 4 -	σ Ophiuchi 17 57	5 —6	μ Canis Maj. 13 54	51-91	§ Boötis 14 46	31-61
φ Draconis 18 18 5 —	γ Cor. Aust. 18 59	6 -6	€ Boötis 14 40	36	44 Boötis 15 o	5 —6
χ Aquilæ 19 36 6 —	δ Cygni 19 41	3 —8	δ Serpentis 15 29	3 -5	ζ Coronæ B 15 35	5 —6
λ Cygni 20 43 5	π Aquilæ 19 43	67	μ Draconis 17 3	4 -42	σ Coronæ B 16 10	6 -61
4 Aquarii 20 45 6 —	π Cephei 23 4	5 -10	ρ Herculis 17 19	41-51	a Herculis 17 9	31-51
TO THE PARTY OF TH	a language	- A -	70 Ophiuchi 17 59	41-7	95 Herculis 17 56	5½-6
THE RESERVE OF THE PARTY OF THE	THE RESIDENCE		e Draconis 19 48	51-91	κ Cephei 20 12	41-81
			ρ Capricorni 20 22	5 -9	ξ Cephei 22 ο	5 -7
			μ Cygni 21 39	56		66
			ζ Aquarii 22 23	4 -42		
			σ Cassiop 23 53	6-8		100
	Harriston Konsey			1		
8" to 12". Mag	s. 12" to 16".	Mags.	16" to 24"/	Mags.	24" to 32".	Mags.
γ Arietis 1 47 4½—	8 Monocer. 6 17	41-7	ζ Piscium 1 7	6 -8	23 Orionis 5 17	5 -7
θ Eridani 2 54 4½-	γ Volantis 7 9	5 -7	a Ursæ Min. 1 18	21-91	κ¹ Herculis 16 3	51-7
f Eridani 3 44 5 —	Ursæ Maj. 13 19	3 -5	χ Tauri 4 15	6 —8	ψ¹ Draconis 17 43	51-6
β Orionis 5 9 1 —	* Boötis 14 9	51-8	24 Comæ B. 12 29	51-7	η Lyræ 19 10	5 —9
6 Antliæ 9 26 6 —		1 —2	a Can. Ven. 12 50	21-61	χ Cygni 19 42	5 -9
2 Can. Ven. 12 10 6 -	The second second	4 -81	e Normæ 16 19	57	A The Break	1. 6
γ Delphini 20 41 4 —		2 -51		4 -83	E 17 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1
A Secretarian	β Cephei 21 27	3 -8		6 -7	Revision leads	VATE
				51-6		7-1
	Name (September 1987)	HAT !		6}-71	THE RESERVE	2700
				41-5	THE PRIVATE	100
				5}-6	The state of the s	1
5			01 Ojgii 21 1	25-0		

and angle of position which the parallax of the Earth's annual motion would produce—he observed in many instances a regular progressive change; in some cases bearing chiefly on their distance, in others on their position, and advancing steadily in one direction, so as clearly to indicate a real motion of the stars themselves, or a general rectilinear motion of the Sun and whole solar system, producing a parallax of a higher order than would arise from the Earth's orbital motion, and which might be called systematic parallax."

To put the matter in a few words, in 1802 Herschel announced to the Royal Society, in a memorable paper, the existence of sidereal systems, consisting of 2 stars revolving about each other in regular elliptic orbits, and constituting binary stars—a term introduced to distinguish them from optical double stars, in which no periodic change of place is discoverable c.

The double stars which after the lapse of 25 years were found by Herschel to possess an orbital motion were about 50 in number; subsequent observers have added many more, and fully 600 stars are now recognised to be thus in motion. But this phrase must not be taken to imply that in every case where 2 stars are observed to approach or recede from one another they form jointly a binary (&c.) system, because changes of distance may and frequently do result only from a difference in the proper motions of the 2 stars. The motion to be binary must be elliptic in its nature, not rectilinear.

Fig. 15, which represents the binary star ξ Ursæ Majoris at the respective epochs of 1865, 1873, and 1883, may be taken as typical of the character of the changes exhibited from time to time by a great number of binary stars.

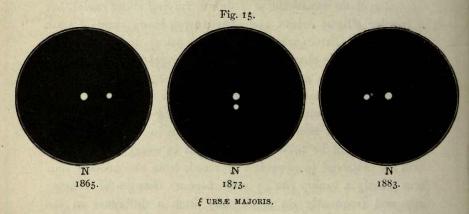
In a subsequent chapter information will be given concerning

c Phil. Trans., vol. xciii. p. 339, 1803; see also vol. xciv. p. 353, 1804. It may be worth mentioning that Lambert (Lettres Cosmologiques) and Mitchell (Phil. Trans., vol. lvii. p. 234, 1767) both conjectured the existence of binary stars. Lambert's book was re-written by M.

Mérian and published in French at Berlin in 1784 under the title of Système du Monde par M. Lambert: a translation of this corrupted edition was made into English by J. Jacque, and published at London in 1800 under the title of The System of the World.

some of the more remarkable of these objects, together with the elements of their orbits determined on the principles of the Newtonian law of gravitation—a law which was first practically applied to this branch of sidereal astronomy by M. Savary in 1830, in the case of ξ Ursæ Majoris d.

The work of cataloguing double stars, initiated by Sir W. Herschel, was followed up with great assiduity by W. Struve, whose large catalogue of 3112 stars—the Mensuræ Micrometricæ—was published at St. Petersburg in 1837. Other subsidiary catalogues were also published at different times by this observer. The system which he adopted was to divide all the double stars



measured by him into 8 classes, and each class into 2 sub-classes, according to the angular distance of the components. The 8 principal classes were as follows:—

I		Dist.	. v.	 		Dist. " -12
II	 between	1-2	VI.	 	12-	-16
III	 	2-4	VII.	 	16-	-24
IV	 9	4-8	VIII.	 	24-	-32

The arrangement of the sub-classes had regard to the magnitudes of the component stars. The 1st sub-class of every

Jahrbuch, 1832, p. 253, and Sir J. Herschel's in Mem. R.A.S., vol. v. p. 171, 1833. See also Arago's Pop. Ast., Eng. ed., vol. i. p. 301.

d Conn. des Temps, 1830, p. 56. Four observations in position and distance are necessary for laying down the orbit of a binary star. Encke's method will be found in the Berliner Astronomisches

principal class consisted of conspicuous doubles, or, as Struve called them, duplices lucidæ; the 2nd of less important doubles, or dunlices relique. The former comprised stars each component of which exceeded in brightness the 81 magnitude; the latter, stars between the magnitudes 81 and 12—which last was assumed to be the smallest visible in the telescope employed (the Dorpat refractor of 15 English inches aperture). Struve's system is arbitrary and inconvenient, for these reasons—that double stars which are also binaries (as many are) frequently pass from one class to another in the course of a few years, and likewise that the magnitudes are not comparable with those assessed on the common scale. Neither Struve's classification nor his scale of magnitudes have been generally adopted by subsequent observers. References to W. Struve's catalogue are generally indicated thus—S. Stars observed and catalogued by his son Otto Struve are frequently indicated thus— σ , or O Σ .

Of late years the subject of double stars has received much attention from Smyth, Dawes, Jacob, Main, Wilson, Seabroke, and Gledhill in England; from Secchi, Dunér, and Dembowski on the Continent; and from Burnham, O. Stone, A. Hall, and Pickering in America.

A comprehensive general catalogue of all the known double stars (embodying the numerous observations of recent years) is now a desideratum, but it is understood that Burnham has one in hand.

According to Smyth, of 653 stars in Struve's 8 orders there are probably only 48 which are optically double. Of the wider ones none have so changed in position as to enable any orbit to be determined, whence it is concluded that even where they have a physical connexion the period of revolution cannot be less than 20,000 years. This statement was made more than 40 years ago, and should perhaps now be qualified.

The following are suggested by Smyth as a few of the more remarkable optically-double stars, but it is obviously absurd to speak of a star as composed of 2 stars where the minor constituent is upwards of 100" distant from its primary:—

	Mags.	Dist
Vega (a Lyræ)	I —II	48
Aldebaran (a Tauri)	I —I2	114
Altair (a Aquilæ)	$1\frac{1}{2}$ —IO	153
Pollux (\(\beta\) Geminorum)	2 —12	206

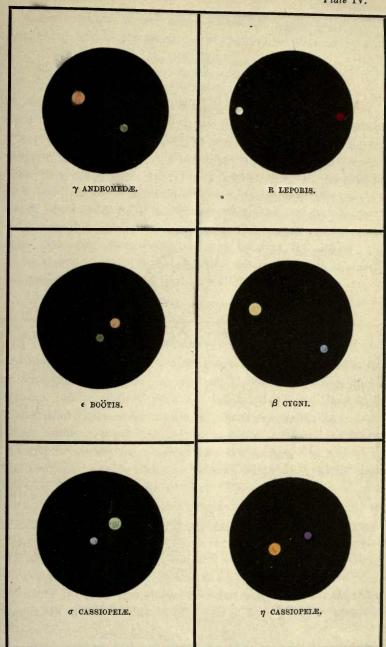
Many double stars exhibit the curious and beautiful phenomenon of complementary colours. In such instances the larger star is usually of a ruddy or orange hue, and the smaller one blue or green. When complementary colours are found in a double star the components of which are of very unequal size, we may attribute the circumstance mainly to the effect of contrast; yet it can hardly be doubted that in many cases colour truly exists. Single stars of a fiery red or deep orange are not uncommon, but isolated blue or green stars are very rare. Amongst the conspicuous stars β Libræ (green) appears to be the only instance. The following may be cited as good examples of coloured pairs:—

Name.	R.A. 1890.	Decl. 1890.	Mag. of Compo- nents.	Dist.	Colour of A.	Colour of B.
and the same of th	h. m. s.	0 ,		"		
η Cassiop	0 42 26	+ 57 13.9	4 71/2	5 (bin.)	Yellow	Purple.
a Piscium	1 56 21	+ 2 14.0	3 4	3	Pale Green	Blue (or var.).
γ Androm.	1 57 8	+41 48.1	3 2 5 2	10	Orange	Green.
Cancri	8 40 3	+ 29 9.7	41/2 61/4	30	Orange	Blue.
ε Boötis	14 40 11	+ 27 32.2	3 6	3	Paleorange	Sea green.
Coronæ	15 35 14	+ 36 59.7	4 5	6	White	Blue.
a Herculis	17 9 38	+ 14 30.9	3 6	5	Orange	Emerald green.
β Cygni	19 26 17	+ 27 43.7	3 7	34	Yellow	Sapphire blue.
σ Cassiop	23 53 25	+ 55 8.5	5 7	3	Greenish	Bright blue.

The following are some generalisations from Struve's catalogue. Of 596 bright double stars there were:—

375 pairs of the same colour and intensity.
101 pairs of the same colour but different intensity.
120 pairs of totally different colours.

e Quoted in Smyth's Cycle of Cel. Obj., vol. i. p. 301. See the original.



COLOURED STARS.

distance. Doberck further shows that a physical connection is most probable where the components are of about the same magnitude, and that most binaries have for their chief component a star between the $7^{\rm th}$ and $8^{\rm th}$ magnitudes. Moreover, very few pairs of stars are physically connected where the distance is greater than $6\frac{1}{2}$ ". It would be interesting to extend Doberck's analysis of Struve's stars to all the known binary stars in order to see whether his conclusions are of universal application.

Niesten has approached this question from another standpoint with the view of ascertaining whether the colours of binary stars depend in any way on the position in its orbit of the smaller companion. He drew up in 1879 a table of colours of 20 binary groups observed during a period of nearly a century, and the results of his inquiries were to this effect:-(1) In systems with well-marked orbital motion, and especially in those of short period, the two components have ordinarily the same yellow or white tints. (2) In systems, as to which we have colour observations sufficient to enable us to connect the colour with the position of the satellite in its orbit, the principal star is white or pale yellow, when the companion is at its periastron, whereas, in the other positions, it is yellow, goldyellow, or orange. (3) The companion follows the principal star in its fluctuation of colour, and often surpasses that in colour as it withdraws from periastron. (4) The same similarity of tints in the two stars appears both in binary groups with rectilinear motion, and in those with orbital motion and long periods of revolution. (5) In perspective binary groups, the companion is almost always blue. This last observation is thought to point to a super-position of tint (as in the case of distant mountains looking blue). From these groups, the small star may be reasonably supposed much further distant than the large one; in fact, near the confines of the visible universe. May not this blue colour (it is asked) be due to a gaseous medium expanded in celestial space, acting on luminous rays which traverse it quite like our own atmosphere, of which it is perhaps merely the continuation?

Of isolated stars which are both large in size and noticeable in colour the following may be mentioned:—

White stars.—a Canis Majoris, a Leonis, β Leonis, a Piscis Australis, a Urszo Minoris.

Red stars.—a Tauri, a Scorpii, a Orionis.

Blue stars.—a Aurigæ, & Orionis, \(\gamma \) Orionis, \(\alpha \) Canis Minoris, \(\alpha \) Virginis.

Green stars.—a Lyræ, a Aquilæ, a Cygni.

Yellow stars .- a Boötis,

The question of change in the colour of stars must perhaps be answered in the affirmative, though the examples are few and the evidence not very conclusive. Ptolemy and Seneca expressly declare that in their time Sirius was of a reddish hue, whereas now, as is well known, it is of a brilliant white. Capella which was formerly red is now blue. It would also seem that γ Leonis and γ Delphini have changed since they were first observed by Sir W. Herschel. He says hat they were perfectly white, whereas the larger components of each were seen by Smyth both to be yellow, and the smaller both green, but I am much inclined to view all such statements as these with distrust.

Admiral Smyth once published i a diagram of coloured discs to guide observers in assigning colours to stars. The diagram contained 4 shades of each of the following colours, viz.:—red, orange, yellow, green, blue, and purple—but it was of no practical use as an adjunct to the telescope: for one cannot compare a glittering and flashing point with a wafer-like circle of dead and opaque colour. But it might suggest the preparation of a series of similar discs in transparent coloured glass to be used with the aid of a lighted lamp behind them. Such a series of discs mounted in a frame might be available in making comparisons of colour. Struve was of opinion that his 9th was the smallest magnitude in which he could recognise colour, but Smyth considered that he could detect blue in stars smaller than that magnitude.

When very powerful telescopes are directed upon some stars which with smaller ones are only seen as single stars or doubles,

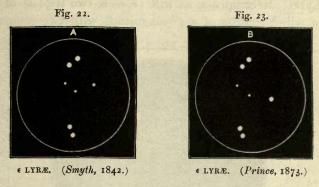
h Quoted in Smyth's Cycle, vol. i. p. 303. I have been unable to find the original.
i In his Sidereal Chromatics, 8vo.

Lond. 1864, p. 54. Reproduced in 1881 in my edition of Smyth's Cycle of Celestial Objects.

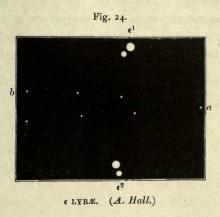
they will be found to consist of 3 or more stars grouped together: such are termed triples, quadruples, quintuples, or multiples, as the case may be. The following are examples, but some of the triples (e. g. γ Argûs) might with propriety be ranked as quadruples:—

Name.	R.A. 1890.	Decl. 1890.	Magnitudes.	Distance.
TRIPLES.	h. m. s.	0 /		" "
ψ Cassiopeiæ	1 18 10	+67 33.3	41 9 11	29 2
γ Andromedæ	1 57 8	+41 48.1	$3\frac{1}{2}$ $5\frac{1}{2}$ 6	10.3 0.4
3760 H Columbæ	5 21 58	-35 26.7	7 7 11	7.3 20
11 Monocerotis	6 23 29	- 6 57.7	61 7 8	7.2 9.6
12 Lyncis	6 36 30	+59 33.1	6 61 71	1.6 8.7
3928 H Puppis	7 1 34	-34 36-1	61/2 81/2 10	5.5 37
ζ Cancri	8 5 54	+18 0.9	6 7 71/2	0.8 5.3
γ Argûs	8 6 8	-47 0.4	2 6 8	42 62
2837 B.A.C. Volantis	8 20 9	-71 9.5	6 61 7	65
A Velorum	8 25 35	-47 33.6	6 9 10	4.4 20
1604 ∑ Crateris	12 3 46	-11 14.0	7 9½ 8	11 40
y Centauri	14 14 44	-57 57.0	6 81 11	9.6 35
51 Libræ	15 58 19	-11 4.1	4 5 7 2	1.1 7.1
379 South, Sagittarii	17 55 40	-23 2.7	7 11 8	5 15
QUADRUPLES.		in the World	To the same of the re	
π ² Canis Majoris	6 50 18	-20 15.9	6 91/2 91/2 10	45 52 125
5112 H Sagittarii	19 17 4	-18 12.0	8 8 8 12	23 20 25
178 P XX. Delphini	20 25 56	+ 10 53.3	7 71 8 12	14 23 0.7
82 Lacertæ	22 30 58	+39 3.9	61/2 61/2 11 10	22 82 28
QUINTUPLE.				
β Lyræ	18 46 1	+ 33 14-1	3-5 8 13 8 2 9	45 46 66 85
MULTIPLES.				
- Orienia	5 33 3	- 2 38.0	[4, 11, 8, 7, 81,]	${12'', 12, 42, }$
o Orionis	0 00 0	2 30.0	(D) 9, 8	(8½",D-8,68")
45 Leporis	5 34 25	-17 56.6	7, 8, 8, 8, 12, 13	[See Cycle.]
a Crucis	12 20 28	-62 29.3	$\left\{\begin{matrix} 1\frac{1}{2}, & 2, & 5, & 12, \\ 14, & 13 \end{matrix}\right\}$	{5, 90, 60, 100,}
ε Lyræ	18 40 41	+ 39 33.2	$ \left\{5, \frac{6\frac{1}{2}}{9\frac{1}{2}}, \frac{5}{13}, \frac{5\frac{1}{2}}{13}, \frac{1}{3}\right\} $	
β Capricorni	20 13 42	-15 11.4	$3\frac{1}{2}$, 7	205

Several of the above are known to be binary &c. systems, and perhaps as time goes on and observers multiply we shall find that others will have to be ranked in the same category. For



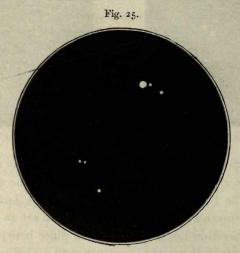
instance, respecting ϵ Lyræ, Prince notes not only a "considerable increase of brilliancy" in the largest of the trio of small stars which lie between the two principal pairs, but also points out that if Smyth's drawing and description are to be relied on, a change of position has certainly taken place between 1842 and 1873. "The central acolyte is more nearly midway between the 2 pairs than formerly, while the largest forms with them, very



nearly, the apex of a triangle k." This object deserves careful scrutiny, for the position angle of both pairs is changing slowly k Month. Not., vol. xxxiv. p. 86. Dec. 1873.

in a retrograde direction. The largest star of the central trio is of magnitude $9\frac{1}{2}$; the other two of magnitude 13.

Fig. 25 represents a sextuple star of almost as great interest as ϵ Lyræ. It comprises, as will be seen, two triplets of stars, one of which consists of a 4th magnitude with two companions



THE MULTIPLE STAR σ ORIONIS

of magnitudes 8 and 7; whilst the other triplet has as its chief star an $8\frac{1}{4}$ magnitude with a 9th magnitude near, and an 8th magnitude at a distance. There really are 10 stars altogether in the group, but the other members are very small and difficult.

¹ A. Hall in 1881 called it mag. 11, was of mag. 16. (Observatory, vol. iv. and said that he could see 6 others on p. 281, Oct. 1881.) the preceding side the smallest of which

CHAPTER III.

VARIABLE STARS.

Variable Stars.—o Ceti.—Algol.—& Cephei.—B Lyra.—R Corona Borealis.—

n Argus.—Miscellaneous remarks.—List of prominent Variable Stars.—Variable
Stars of the Algol Type.—U Ophiuchi.—Chandler's generalisations on the colours
and periods of Variable Stars.—Statistics by Espin.—Temporary Stars.—Notices
of Stars which have disappeared.—Are Temporary Stars and Variable Stars
identical in character?

THERE are many stars which exhibit periodical changes of brilliancy: these are termed *Variable* stars. About 200 stars are now known to belong to this class, and many more still are put down as "suspected."

One of the most interesting, as also the first that was recognised, of these curious objects, is o Ceti, or Mira [sc. stella]. It appears about 12 times in 11 years; remains at its greatest brightness for about a fortnight, when it sometimes equals in brilliancy a star of the 2nd magnitude; decreases during about 3 months, till it becomes totally invisible; remains so for about 5 months, and then gradually recovers its brilliancy during the remaining 3 months of its period. Its maximum brightness is not always the same, nor does it always increase or diminish by the same gradations; nor are the successive intervals of its maxima equal. The mean period is 331^d 8^h, but it would appear from the researches of Argelander a that this is subject to a cyclical variation embracing 88 such periods, which has the effect of gradually lengthening and shortening alternately these periods

to the extent of 25 days one way and the other. It is not improbable too that the irregularities of its maximum brilliancy are also periodical, that is to say, that at every 11th maximum the star's brightness is above the average. On Oct. 5, 1839 (the epoch of maximum for that year, according to Argelander), Mira was unusually bright, excelling a Ceti and equalling β Aurigæ. On the other hand, according to the testimony of Hevelius, between Oct. 1672 and Dec. 1676 it did not appear at all^b. The average duration of the naked-eye visibility is about 18 weeks, but in 1859–60 Mira was observed with the naked eye during 21 weeks, whilst in 1868 the term was but 12 weeks.

I append a few details connected with the history of this star:—

On Aug. 13, 1596, David Fabricius noted a star in Cetus to be of the 3rd magnitude, and that in October of the same year^c it had disappeared. Seven years later, or in 1603, Bayer affixed the letter omicron (o) to a star in Cetus placed exactly where the star of Fabricius had disappeared. He observed it to be of the 4th magnitude, but not comparing the former observations of Fabricius with his own he failed to make the discovery which was within his grasp.

In the beginning of Dec. 1638, Phocylides Holwarda of Franccker saw this star shining brighter than one of the 3rd magnitude. In the summer of the following year he was unable to find any trace of it, but on Oct. 7 he again perceived it; and to him may be assigned the honour of having first discovered the existence of a variable star.

In 1648 Hevelius commenced a careful series of observations, which were carried on till 1662, during which time he placed the certainty of the discovery beyond a doubt, and made a first approximation to a knowledge of the attendant circumstances d. In the following century, between the years 1779 and 1790,

b Lalande, Astronomie, Art. 794. But it has been suggested that this was because the maxima occurred during months when the constellation Cetus was lost in the Sun's rays.

c Kepler, De Stellå Novå, cap. xxiii. p. 115.

d Historiola Miræ Stellæ. Fol. Gedan, 1662.

Sir W. Herschel observed this star with his wonted diligence, and materially added to our knowledge of it. In more recent times the name of Argelander may be singled out as specially associated with o Ceti.

Algol, or β Persei, is a variable star of short period, which from its Northern position may often be under the notice of observers in Great Britain. It is commonly of the 2^{nd} magnitude: from that it descends to the 4^{th} magnitude in a period of about $3\frac{1}{2}^{h}$, and at this it remains for about 20^{m} . Another period of $3\frac{1}{2}^{h}$ then brings the star up to the 2^{nd} magnitude, at which it remains for another period of 2^{d} 13^{h} , when similar changes recur. Near the epoch of maximum and minimum the variations of brilliancy proceed slowly, but at the intermediate stages they are much more rapid, and therefore more noticeable. The exact period in which all these changes take place is 2^{d} 20^{h} 48^{m} 55^{s} . Pickering suggests that the range of variability is less than that stated above, and that it is no more than about 1 magnitude.

The observations of Argelander, Heis, and Schmidt tend to show that the period of Algol is less than it was in former years, but that this diminution is not uniformly progressive, inasmuch as an augmentation has now set in; and it may be inferred that future and long-continued observations will result in the discovery that this change of period is itself periodical.

The variability of Algol was discovered by Montanari in 1669 and confirmed by Maraldi in 1694: its period was determined by Goodricke in 1782, who also may be said to have re-discovered its variability ^f.

δ Cephei is another variable star which derives additional interest from the fact that its position in the heavens permits frequent observation of it in England. Its period is 5^d 8^h 47^m, counting from minimum to minimum, and its range is from mag. 3½ to mag. 4½. The interval between the maximum and minimum is greater than that between the minimum and

^e Phil. Trans., vol. lxx. p. 338. 1780. Algol by means of original observations of The Saxon farmer Palitzch, noted for his early detection of Halley's comet in 1758, also investigated the period of

maximum, the former being 3^d 19^h, the latter only 1^d 14^h. The variability of this star was discovered by Goodricke in 1784.

B Lyræ is a variable star, remarkable as having a double maximum and minimum within its simple period. Goodricke, the discoverer, assigned to it a period of about 63d, but the more recent observations of Argelander show that the true period is double this; or, more exactly, 12d 21h 53m—thus set forth g: Starting from a maximum when the star is of mag. 3½ it reaches the first minimum of mag. 4; then follows a second maximum, and after that a second minimum, but at this second period of least light the star is fainter than before, being only equal to a 4½ mag. Argelander further ascertained that, as in the case of o Ceti, the period of β Lyree is itself variable; that down to the year 1840 it was increasing, but that from that period it began to decrease, and was continuing to do so at the time the remark in question was made (1866). The annual amount of the increment gradually diminished till the stationary epoch, whence we may anticipate by analogy that now the decrement will gradually become more rapid.

The variable star R Coronæ Borealis is noticeable from the fact that on some occasions the fluctuations in brightness between the maximum and minimum epochs are so inconsiderable as to be scarcely perceptible, but that after some years of these almost insensible variations, the fluctuations become so great that at its minimum the star either descends to some such mag. as 13, or entirely disappears. The period of this star is commonly put at 323 days, but it cannot be said that that period is conclusively accepted. At its maximum its brilliancy is that of a star of the 6th magnitude. Its variability was discovered by Pigott in 1795.

Perhaps the most remarkable variable star with which we are acquainted is η Argûs—an object unfortunately not visible in England. The following historical notes, down to 1850, were brought together by Humboldt ^h.

⁸ Argelander, Ast. Nach., vol. xxvi. h Quoted in Arago's Pop. Ast., vol. i. No. 624. Jan. 22, 1848. p. 258, Eng. ed.

As early as the year 1677, Halley, on his return from St. Helena, frequently expressed a doubt respecting the constancy of the brightness of the stars in the constellation Argo; he had especially in his mind those belonging to the prow and the deck, the magnitudes of which had been indicated by Ptolemy. But the uncertainty of the ancient designations, the numerous variations of the manuscript of the Almagest, and especially the difficulty of obtaining exact evaluations of the brightness of the stars, did not permit him to transform his suspicions into a certainty. In 1677 he classed n Argûs among the stars of the 4th magnitude; in 1751 La Caille found it to be of the 2nd magnitude. Subsequently it resumed its original appearance, for Burchell, during his residence in South Africa from 1811 to 1815, noted it to be of mag. 4. From 1822 to 1826 it appeared to be of mag. 2 to Brisbane in New South Wales, and to Fallows at the Cape. In 1827 Burchell, then residing at St. Paul in Brazil, found it to be of mag. 1, and almost as bright as a Crucis. A year afterwards it had decreased to the 2nd magnitude. To this class it still belonged on Feb. 29, 1828, when Burchell observed it at Goyaz, and it is under this magnitude that Johnson and Taylor have entered it in their catalogues, 1829-1833. When Sir J. Herschel was at the Cape between 1834 and 1837 he placed it constantly between mags. 2 and 1: but on Dec. 16 in the latter year, whilst scrutinising the stars lying around the great nebula in Argo, his attention was attracted towards a served on former occasions, had so rapidly increased in brightness as to equal a Centauri, surpassing every other star in the heavens except Canopus and Sirius. Its maximum brilliancy occurred on or about Jan. 2, 1838. Thenceforward it began to fade away; in April, however, it was still as bright as Aldebaran. diminution went on till April 1843, though at no time did the star fall below the 1st magnitude. In April a rapid augmentation set in, and according to the observations of Mackay at Calcutta and Maclear at the Cape, η Argûs surpassed Canopus and scarcely fell short of Sirius in brilliancy. Under date of Feb. 1850

Lieut. Gilliss, then in Chili, reported η Argûs to be of a reddish yellow colour, somewhat darker than that of Mars, and very nearly as bright as Canopus.

Since 1850 much has been done, especially by E. B. Powell and Tebbuttⁱ, towards elucidating the anomalous irregularities (as they were long deemed to be) in the light of η Argûs, and a diagram submitted in 1869 to the Royal Astronomical Society by Loomis^k seems to make the matter fairly clear. On the whole we are justified in assuming that η Argûs varies from





DIAGRAM REPRESENTING THE LIGHT-CURVE OF η ARGÛS. (Leomis.)

mag. 1 to mag. 6 or 7 during a period of about 70 years or more, though Schönfeld considers that it has no regular period at all. The maximum phase appears to be complicated, and to consist of three maxima which jointly occupy about 25 years of the 70, during which sub-period the oscillations are restricted to mags. 1 and 2, this sub-period falling as near as may be in the midinterval between every 6th mag. minimum of the star.

Some remarkable circumstances connected with η Argûs and the nebula surrounding it will more appropriately be related in the next chapter.

Several explanations have been offered to account for the variability of stars, but all are unsatisfactory because the irregularities of the periods offer a bar to any hypothesis which supposes a regular series of changes. Boulliaud, in the case of o Ceti, ascribed its variability to its being a globe of irregular luminosity rotating on an axis, by which different portions of the differently illuminated surface were successively turned towards us¹.

Pigott suggested that an opaque body revolving round a

¹ Month. Not., vol. xxvi. p. 83, Jan. 1866; and vol. xxviii. p. 266, October 1868.

^k Ibid., vol. xxix. p. 298, May 1869. ¹ Ad Astronomos monita duo. 4to. Paris, 1667.

variable star as its primary, whose light would be cut off from time to time after the manner of an eclipse of the Sun, would produce the phenomenon^m; and this explanation, old as it is, has not yet been superseded by any better one.

The following are some of the more important and prominent periodic stars visible to the naked eye:—

Name.		R.	A. 189	00	Decl. 1890.		Period.	Changes Magnitud	
β Persei		h.	m. I	s. 2	+ 40	31.9	d. 2.86	From 2.2	to 3.7
δ Cephei	 	22	25	5	+ 57	51.1	5.36	3.7	4.8
η Aquilæ	 	19	46	52	+ 0	43.5	7.17	3.6	4.7
β Lyræ	 	18	46	I	+ 33	14.1	12.91	$3\frac{1}{2}$	$4\frac{1}{2}$
a Herculis	 	17	9	38	+14	30.9	88-5: irreg.	3.1	3.9
o Ceti	 	2	13	47	- 3	28.7	330	2	0
R Hydræ	 	13	23	42	-22	42.7	436	4	10
η Argûs	 	10	40	47	- 59	6.5	70 years?	1	6

The following is a list of Variables which have been described as of the "Algol type" owing to the fact that their light variations take place in the course of a few hours, followed by a period of constant light. The number of stars of this type is very limited.

No.	Name.	R.A. 1890.	Decl. 1890.	Period.	Variation.
7		h. m. s.	0 /	d. h. m.	MARKET PORTER!
I	U Cephei	0 52 34	+81 16.0	2 12 0	7.2 to 9.1-9.4
2	β Persei	3 1 1	+40 31.9	2 20 48	2.2 to 3.7
3	λ Tauri	3 54 35	+12 10.8	3 22 48	3.4 4.2
4	155 Uran. Arg. Can. Maj.	7 14 29	-16 11.3	1 3	6.2 68
5	S Cancri	8 37 39	+ 19 25.9	9 11 37	8.2 to 9.8—11.7
6	δ Libræ	14 55 5	- 8 4.9	2 7 51	4.9 to 6.1
7	U Coronæ				7.6 to 8.8
8	U Ophiuchi	17 10 59	+ 1 19.9	0 20 7	6.0 to 6.7
100					

U Ophiuchi is a variable which presents some features of interest in that it has the shortest known period of any variable

VOL. III.

m *Phil. Trans.*, vol. lxxiii. p. 482, 1783. E

star, and is of a magnitude capable of being dealt with by any telescope however small. Its period is 20^h 7^m 41^s. It remains at its maximum (6) for 16 hours, and all its changes from maximum to minimum (6\frac{3}{4}) and back again to maximum are accomplished in about 4^h. This star is sometimes called Sawyer's Variable, from its period having been worked out by E. F. Sawyer in 1881, but its variability was suggested by Schjellerup as far back as 1863, and a variation of magnitude from 6 to 6·5 was observed by Davis at Cordoba in 1871.

Hind has called attention to the fact that variable stars, especially the smaller ones, are frequently of a ruddy colour. The same observer has noticed that when at their minimum they appear surrounded by a kind of fog. Arago remarked that if this latter opinion should turn out to be well founded it might give us a clue, none other than that the diminution of brilliancy is due to the interference of clouds which cut off a part of the stellar light. It may here be noted as an undoubted fact that with respect to red variable stars as they lose light they gain colour and vice versa, which circumstance favours the hypothesis that absorption of light is the cause of the phenomenon.

Chandler has endeavoured, and with a considerable measure of success, to connect together the colours and periods of variable stars. He has laid down the 3 following preliminary laws:—
(1) Variable stars are generally red; (2) They increase in brightness more rapidly than they decrease; (3) The more red they are, the longer their periods °. Taking 112 variables whose colours and periods are recorded with fair certainty, Chandler found himself able to frame the following table:—

Periods in days.	White or yellow. per cent.	Red or reddish.
Under 100	52	48
100-200	22	78
200-300	26	74
300-400	8	92
Over 400	0	100

[&]quot; Pop. Ast., vol. i. p. 260, Eng. ed.

O Quoted in Observatory, vol. vii. p. 340, Nov. 1884.

In another form his data yield the following results:—

Colour of Star.			Average.
****			d.
White		 	126
Yellow		 	124
Yellow-red	•	 	212
Red		 	288
Intense red		 	77

The progressive increase in the periods with the increase in the intensity of the colour cannot be fortuitous.

Espin has framed q some statistics concerning the distribution of variable stars in the heavens, and concerning their periods, which are so extremely interesting that a brief summary of them must be given in this place:—(1) Variable stars are to be found in a well-marked zone inclined 15° or 20° to the Equator; (2) This zone crosses the preceding side of the galactic circle N. of the Equator, and the following side S. of it; (3) In crossing the preceding side the zone is not many degrees broad, and is very clearly marked, but where it crosses the following side it is broken up into 2 streams; (4) The division into 2 streams occurs where the galaxy is also divided into 2 streams; (5) In this part the variable stars are intimately connected with the galaxy, often occurring in the gaps, and constantly on the edges of the gaps, but rarely in the centre of the star-sprays from the galaxy; where the zone crosses the preceding part of the galaxy it is marked sharply and clearly and seems unconnected with the galaxy; (6) It is noteworthy that with one or two exceptions all the temporary stars have appeared in the region where the galaxy and the variable star zone are both broken into 2 streams; (7) The stars which do not belong to the above-named zone are chiefly the bright and short-period variables; (8) If the stars strongly suspected to be variable are taken into account the foregoing conclusions become still more obvious.

Following up these results Espin has proceeded to consider whether any and what conclusions may be drawn from an

P Science Observer, July 1878. 1881; Ib., vol. v. p. 77, March 1882; Ib.,

examination of the known variable stars grouped in periods. He found in 1882 that the variables then known readily fell into 2 classes, as follows:—

- (1.) Period less than 70 days.
- (2.) Period more than 135 days.

Further, that there were no stars with periods between 71 and 135 days; that no such gap occurs anywhere else between the shortest and the longest known periods respectively; and that the number of stars decreases rapidly on one side of the gap and increases on the other side thereof. Other considerations also point to a division into 2 classes. For instance, Chandler's results, given above, adapted to Espin's method of classification, yield the following figures:—

Period,	Total No.	White: yellow.	Red: reddish.	Per cent.
Less than 71 days	27	14	13	49
More than 135 days	84	11	74	88

It thus appears that white or yellow stars slightly predominate in the 1st class or short-period group; whilst they form but a small minority in the 2nd class or long-period group. Again—in the 1st class there are a large number of bright stars (15 out of 32 being above the 4th magnitude); whereas in the 2nd class there are but few bright stars (only 5 out of 87 being above the 4th magnitude).

The general conclusions derivable from Espin and Chandler's investigations are, that taking into account the attributes of period, colour and magnitude, the known variable stars may be divided into 2 principal classes:—

- (1.) Period, less than 70 days; colour, white or red in tolerably even numbers; magnitude, large.
- (2.) Period, more than 135 days; colour, mainly red; magnitude, small.

What has been said up to this point concerns variable stars as a whole, but it appears possible to draw some further conclusions from an examination of them class by class. For instance, tabulating the 32 stars in Espin's 1st class in periods of 10 days, we find that 16 out of the 32 have periods of less than 10 days.

Tabulating them according to the number of magnitudes through which they vary, we find that 26 vary one magnitude; 4 vary through 2 magnitudes; 2 vary through 3 magnitudes; so that the greater the extent of the variation the fewer the stars. The average period of the 26 stars which vary one magnitude is 18.7^d; of the 4 stars which vary 2 magnitudes, is 32.7^d; of the 2 stars which vary 3 magnitudes, is 48.8^d; so that increase of variation is attended by increase of period. Hence it follows that:—

- (1.) If the variation is small, the period will probably be short.
- (2.) If the star is a bright one, the period will probably be short.

Treating in a somewhat similar manner the stars in his 2nd class, Espin finds as follows with respect to the number of stars in relation to the period:—

Period.		No. of Stars.	Period. d.		No. of Stars.
135-170	 	7	320-370		21
170-220	 	9	37C-420		15
220-270	 	10	420-470		7
270-320	 	15	470-520	1.7	3

Tabulating them according to the number of magnitudes through which they vary, we find: -

Vary in Mag.	No. of Stars.	Vary in Mag.	No. of Stars.
I	 3	5	27
2	 3	6	25
3	 6	7	6
4	 14	8 and 9	3

Hence it follows that:-

- (1.) Up to a period of (say) 420 days the number of stars increases with the length of the period.
- (2.) Up to a range of 6 magnitudes the number of stars increases with the variation in magnitude.

Espin has carried his statistics beyond this point, but, as it seems to me, on data not sufficient for trustworthy conclusions to be drawn. I will therefore only add that he thinks there

are indications that there are a certain number of stars in the heavens which should be formed into a class by themselves by reason of the fact that their light is constant for long periods of time (years) in succession, then alters a magnitude or so, and after a very short space of time (weeks) returns to its normal value for another long period of time.

Somewhat similar in character to the variable stars are the "temporary" stars—stars which suddenly blaze out in the heavens and after a while fade away. The first on record was observed by Hipparchus. Pliny informs us that it was the appearance of this star which induced Hipparchus to construct his catalogue of stars, the first which was ever executed. This statement was by many regarded as a fiction, but E. Biot found that a new star in Scorpio is recorded in the Chinese chronicles under the date of 134 B.C., so that there is no longer any ground for rejecting Pliny's statement. It may be added that the date commonly assigned to Hipparchus's catalogue is 125 B.C.

Brilliant stars are said to have appeared in or near Cassiopeia in the years 945, 1264 r, and 1572. The last was a very remarkable one, and a most elaborate and graphic account of it is given by Tycho Brahe s, some extracts from which will be found in Humboldt's Cosmos. The substance of his description is as follows: The star lasted from November 1572 to March 1574, or 17 months. It was brighter than Sirius, and rivalled Venus. Its colour was successively white, yellow, red, and white again, and it remained stationary all the while in the position which it occupied when discovered. It has been suggested that the stars of 945, 1264 and 1572 are identical, being apparitions of a variable star of long period. There exists at this moment (as was pointed out by D'Arrest in 1864 t), within 1' of the place assigned by Argelander to Tycho's star, a small star sensibly

r As to the star of 1264, Lynn has given good reasons for doubting whether there ever was such a star (*Observatory*, vol. vi. p. 126, April 1883); and the "star" of 945 rests upon no authenticated record. But in both years large comets were visible.

s Progymnasmata, lib. i.

t D'Arrest published a map of the neighbourhood. It will be found in Oversigt over det Kgl. danske Videnskabernes Selskabs Forhandlinger og dets Medlemers Arbeider i Aaret 1864, p. 1.

variable in its light, according to the observations of Hind and Plummer in 1873 ^u. The star assumed by those observers to be Tycho's follows a 9th magnitude at a distance of 29.6^s, and 10′ 4″ to the S. This 9th magnitude may be found by noting that it follows 10 Cassiopeia (a star of magnitude 6) at a distance of 17^m 12^s and is 6.4′ to the N. of it. The following should be the position for 1890 of Tycho's star, according to Argelander:—

In November 1876, presumably between the 20th and 24th (for general bad weather rendered the precise day uncertain), a remarkable outburst of stellar energy took place in Cygnus. Soon after sunset on November 24 Schmidt at Athens observed in this constellation a new star of the 3rd magnitude and of a yellow colour. Unfortunately much delay occurred in communicating the discovery of this star to the astronomers of Western Europe, and when its existence became generally known early in December it had sunk to the 5th magnitude. It continued to diminish day by day, and by the end of December was no brighter than a 7th magnitude star. It was of a decidedly orange-red tint. The position of this star (for 1890.0) is:—

Temporary stars of considerable brilliancy shone forth in 1604 and 1670. The former appeared in the constellation Ophiuchus, and became nearly as bright as Venus; it lasted 12 months or more *. The latter appeared in Cygnus, and attained the 3rd magnitude; it lasted altogether 2 years, but faded away and then blazed out again more than once before its final disappearance **.

On April 28, 1848, a new star of the 5th magnitude was seen by Hind in Ophiuchus z. It rose to the 4th magnitude a few

^u Month. Not., vol. xxxiv. p. 168. Feb. 1874.

x Kepler, De Stella nova in pede Serpentarii.

⁷ Phil. Trans., vol. v. p. 2087 et seq., 1670; also vol. vi. p. 2197 et seq., 1671. ² Month. Not., vol. viii. p. 146. April

weeks later; subsequently its light diminished, and now it is usually of the 11th or 12th magnitude a.

The remarkable star which blazed forth in the constellation Corona Borealis in May 1866 needs a brief mention here in order to make this chapter complete, although the star itself is treated now as a recognised variable (=T Coronæ), and is entered accordingly in the catalogues. This star, recorded by Argelander in 1855 as being of magnitude 9½, was seen by Birmingham at Tuam on May 12, 1866, as a star of magnitude 2. Combining the negative testimony of Schmidt of Athens with the positive testimony of Birmingham, it would seem that the star rose from the 4th to the 2nd magnitude in about 3 hours on the evening in question. It soon began to fade away, and by the end of May had fallen to magnitude 8. It continued below magnitude 9 all through the following summer, but rose to magnitude $7\frac{1}{2}$ in September, and remained nearly stationary in brightness for the remainder of the year.

Sir J. Herschel remarked:—"It is worthy of especial notice, that all the stars of this kind on record, of which the places are distinctly indicated, have occurred, without exception, in or close upon the borders of the Milky Way, and that only within the following semicircle, the preceding having offered no example of the kind b."

Numerous instances are on record of stars formerly known which are now not to be found c, and vice versa of new stars appearing which were never before noticed. There once were stars to the number of 4 in Hercules, 1 in Cancer, 1 in Perseus, 1 in Pisces, 1 in Hydra, 1 in Orion, and 2 in Coma Berenices, which seem now to have disappeared. Several stars in the catalogue of Ptolemy do not appear in that of Ulugh-Beigh; 6 of these were near Piscis Australis, and as 4 were of the 3rd magnitude, Baily concludes that they were visible in Ptolemy's

^a Arago and other writers say that this star disappeared; but Hind has expressly stated this to be incorrect. Month. Not., vol. xxi. p. 232. June 1861. It is now regularly included in catalogues

of variable stars, and treated as such.

b Outlines of Ast., p. 605.

^c Sir W. Herschel, *Phil. Trans.*, vol. lxxiii. pp. 250-3. 1783.

time, but disappeared before the time of Ulugh-Beigh. Many discrepancies have, no doubt, arisen from mistaken entries, yet there are other instances in later times which it seems out of the question to explain in this way. Thus 55 Herculis, mag. 5, was observed by Sir W. Herschel in 1781 and 1782, but 9 years afterwards it could not be found, and has not been seen since. In May 1829 Sir J. Herschel missed one of De Zach's stars in Virgo. Montanari remarked, in 1670, as follows:—"There are now wanting in the heavens 2 stars of the 2nd magnitude, in the stern and yard of the Ship Argo. I and others observed them in the year 1664, upon the occasion of the comet that appeared that year. When they first disappeared, I know not; only I am sure that on April 10, 1668, there was not the least glimpse of them to be seen d."

Two suggestions may here be submitted:—(1) all the "temporary" stars on record, and (2) such of the "missing" stars as do not depend on errors of observation, would be found to be ordinary "variable" stars could their history be properly traced. Nevertheless Kirkwood considers the theory that temporary stars are long-period variables to be unsound, and that the suddenness of their apparition, the short duration of their brightness, and the great length of their supposed periods are all so many reasons for treating them as distinct from what are commonly known as "variable starse."

d Phil. Trans., vol. vi. p. 2202. 1671. [Translated.]

[·] Amer. Acad., Art and Sciences, 1884.

CHAPTER IV.

CLUSTERS AND NEBULÆ.

Arranged in three classes.—Five kinds of Nebulæ.—The Pleiades.—The Hyades.—
Mentioned by Homer.—Præsepe.—Opinion of Aratus and Theophrastus.—Coma
Berenices.—List of Clusters.—Annular Nebulæ.—Elliptic Nebulæ.—Spiral
Nebulæ.—Planetary Nebulæ.—Nebulous Stars.—List of irregular Clusters.—
Notes to the objects in the list.—The Nubeculæ major and minor.—List of
Nebulæ in Sir J. Herschel's Catalogue of 1864.—Historical statement relating
to the observation of Nebulæ and Clusters.

If we examine the heavens on a clear evening when the Moon is not shining, we shall find here and there groups of stars which seem to be compressed together in such a manner as to present to the naked eye or under inadequate optical power a hazy cloud-like appearance; these are termed clusters and nebulae, and may be conveniently classed as follows:—

- 1. Irregular groups, visible more or less to the naked eye.
 - 2. Clusters resolvable into separate stars with the aid of a telescope.
 - 3. Nebulæ, for the most part irresolvable with the telescopes which we at present possess.

The objects forming the 3rd class may in their turn be subdivided into—

i. Annular nebulæ.

ii. Elliptic nebulæ.

iii. Spiral nebulæ.

viv. Planetary nebulæ.

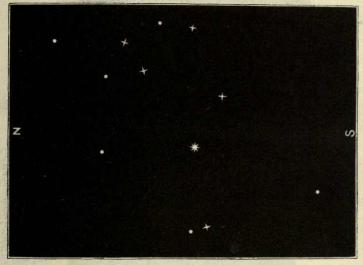
v. Nebulous stars.

Of the 1st class there are several examples to be found, with all of which the reader is probably more or less familiar. The

cluster of the *Pleiades*, in Taurus, is doubtless the best known. When examined *directly* few persons can see more than 6 stars, but by turning the eye *sideways*, more may be seen. Thus, Miss Airy has noted 12, and Möstlin, according to Kepler, 14. Between 50 and 60 stars, to say the least of it, are visible in a telescope. The following are some of the different estimations:—

Kepler	 	32	Hooke	 	78
La Hire	 	64	De Rheita	 	118

Fig. 27.



THE PLEIADES, IN TAURUS. NAKED-EYE VIEW. (Miss Airy.)

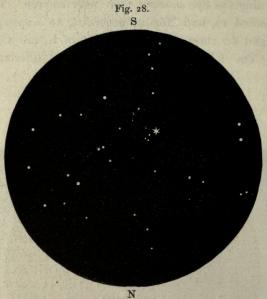
These totals have been greatly exceeded by subsequent observers, and indeed photography has registered fully 1400 stars in the Pleiades.

The most brilliant star in the group is Alcyone, or η Tauri, of the 3rd magnitude; next in order come Electra and Atlas, of the 4th; Maia and Taygeta, of the 5th; Pleione and Celeno, which are

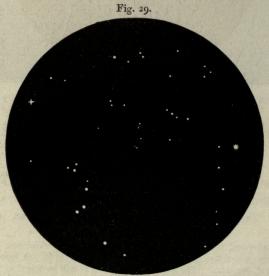
^a The Pleiades and Hyades are among the few stars mentioned by Homer. (Odyssey, lib. v. ver. 270.) The engraving by Jeaurat is taken from Hist. de

l'Acad. Royale des Sciences, 1779, p. 505; published in 1782. A good lithograph by Tempel will be found in Month. Not., vol. xl. p. 622, 1880.

between the 6th and 7th; Asterope, between the 7th and 8th; and finally, a great number of smaller stars.



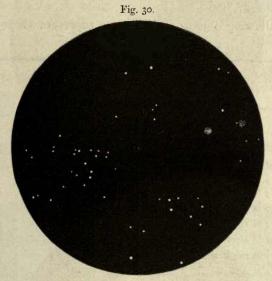
THE PLEIADES, IN TAURUS. TELESCOPIC VIEW. (Jeaurat.)



THE HYADES, IN TAURUS.

The Hyades is another loose group in Taurus, near Aldebaran, and somewhat similar in character is the cluster near λ Orionis, neither of them of much account as telescopic objects, the stars being too scattered to make a good field.

Presepe, or the "Bee-hive," in Cancer, is one of the finest objects of this kind for a small telescope; it is an aggregation of little stars, which has long borne the name of a nebula, its components not being visible to the naked eye; indeed, before the invention of the telescope, it must have been almost the only



PRÆSEPE, IN CANCER.

recognised one. Aratus b and Theophrastus c tell us that its becoming dim and ultimately disappearing was regarded as an indication of rain.

The group forming the constellation Coma Berenices has fewer stars, but they are of larger size and more diffused. As Webb well remarks, "This is a gathering of small stars, which obviously at a sufficient distance would become a nebula to the naked eye."

b Diosemeia, ver. 160. See Lamb's translation, p. 70, where the passage is very prettily rendered into English verse.

c De Signis Pluviarum, p. 419. Heinsius's ed., Lugd. Batavor.

In reference to globular clusters and the hypothesis that they are formed of stars evenly distributed in space, Guillemin remarks: "But the increase of brightness from the border to the centre is often more rapid than the hypothesis of an equal distribution of the stars in the interior will sanction. It has been held therefore that besides the apparent or purely optical condensation, there exists a real condensation, which is produced doubtless by the influence of the central forces, resulting from the separate attractions of each of the suns which compose these systems d."

The following objects will serve as representatives of the 2nd class *:-

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.	A. 18	90.	Decl.	1890.
				h.	m.	8.	0	,
I	31 H VI Cassiopeiæ	663	392	1	38	39	+60	41.3
2	33 H VI Persei	869	512	2	11	20	+ 56	38.5
3	35 Geminorum	2168	1360	6	2	4	+ 24	21.2
4	3 M Canum Venat	5272	3636	13	37	3	+ 28	55.3
5	5 M Libræ	5904	4083	15	12	57	+ 2	30.1
6	80 M Scorpii	6093	4173	16	10	26	-22	43.2
7	13 M Herculis	6205	4230	16	37	45	+ 36	39.9
8	92 M Herculis	6341	4294	17	13	46	+43	15.1
9	22 M Sagittarii	6656	4424	18	29	28	-23	59.4
10	11 M Antinoï	6705	4437	18	45	13	- 6	24.1
, 11	15 M Pegasi	7078	4670	21	24	38	+ 11	40.3
12	2 M Aquarii	7089	4678	21	27	44	- 1	19.1

No. 1 is a somewhat conspicuous object, that is to say, it is readily visible with a telescope of 2in aperture.

No. 2 lies in immediate proximity to 34 H VI Persei, and the two objects are frequently taken together and spoken of as "the cluster in the sword-handle of Perseus." These two clusters have been well termed by Webb "gorgeous," and by Smyth were

d The Heavens, Eng. ed., p. 377.

o Most of the clusters and nebulæ engraved in this chapter but not separately

mentioned will be found alluded to in the Catalogue of Celestial Objects in Chapter X (post).

described as "affording together one of the most brilliant telescopic objects in the heavens."

No. 4 (3 M Canum Venaticorum) was described by Smyth as "a brilliant and beautiful globular congregation of not less than

1000 small stars." There is a sensible concentration of stars near the centre of the cluster.

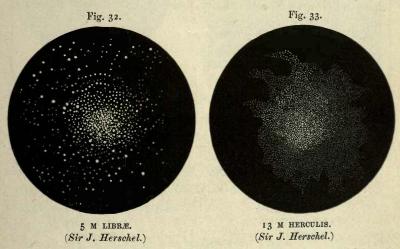
No. 5 (5 M Libræ), in the words of Webb, is a "beautiful assemblage of minute stars greatly compressed in centre." Sir W. Herschel with his 40-ft. reflector made out about 200 stars; Sir J. Herschel notes that the stars range between mags. 11-15.

No. 6 (80 M Scorpii) much resembles a telescopic comet. Sir



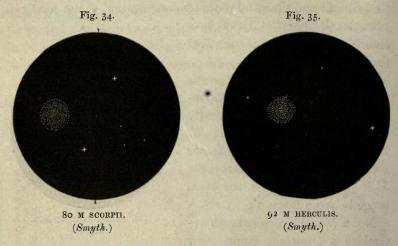
3 M CANUM VENATICORUM. (Smyth)

W. Herschel called it the richest and most condensed mass of stars in the firmament. Near its centre, or, as Webb suggested,

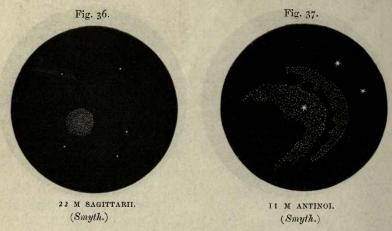


"between it and us," is a remarkable variable star, particulars of the sudden apparition of which in 1860 will be found elsewhere (see Chap. V., post).

No. 7 (13 M Herculis) is commonly regarded as the finest of the globular clusters. Smyth called it "an extensive and magnificent mass of stars, with the most compressed part densely



compacted and wedged together under unknown laws of aggregation,"—a very good description. Sir J. Herschel spoke of thousands of stars and "hairy-looking curvilinear branches,"



which features the Earl of Rosse interpreted as indicative of a spiral tendency; he also perceived several dark rifts in the interior of the cluster. In 1887 Harrington at Ann Arbor was

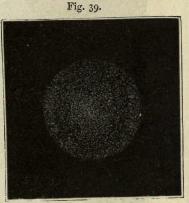
able to see Rosse's rifts not only with a 12-inch but with a 6-inch refractor f. Huggins finds the spectrum to be continuous. This cluster was discovered by Halley in 1714, and is visible in one sense with any telescope, however small.

No. 8 (92 M Herculis) is a fine globular cluster, inferior however to the preceding. It has a marked central condensation, and exhibits a continuous spectrum.

No. 9 (22 M Sagittarii) is a fine globular cluster, so situated that in England it is rarely possible to do justice to it. Webb remarked that this object is "interesting from the visibility of the components (the largest, 10 and 11 mags.), which makes it

Fig. 38.

15 M PEGASI. (Smyth.)



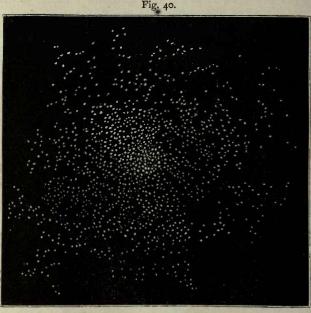
2 M AQUARII. (Sir J. Herschel.)

a valuable object for common telescopes, and a clue to the structure of more distant or difficult nebulæ."

No. 10 (11 M Antinoï) is an interesting cluster of uncommon form. Smyth likened it to a flight of wild ducks—a simile more appropriate than many of those met with in astronomical writings, which it may be fairly said often abound in wordy exaggerations. Three stars of mag. 8 help to enhance the beauty of the field.

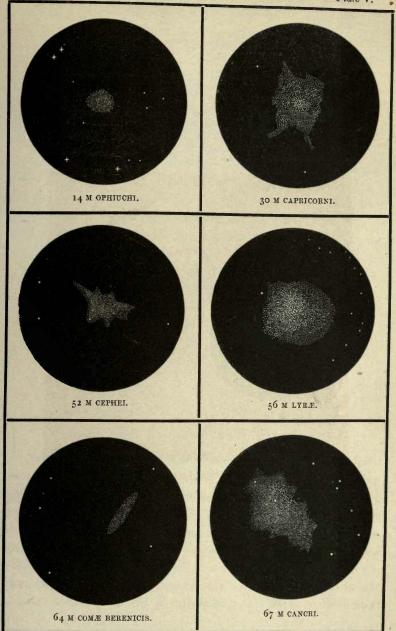
No. 11 (15 M Pegasi) is a moderately bright and resolvable cluster. Large apertures are required to make it worthy of much attention.

No. 12 (2 M Aquarii) is with small telescopes a round nebula exhibiting, in Webb's words, "a granulated appearance, the precursor of resolution." The truth of this remark will become more manifest if we compare Lord Rosse's figure with Sir J. Herschel's. Sir John compared this object to a heap of fine sand, and considers it to be composed of thousands of 15-mag. stars, a statement which is probably a little over-drawn.



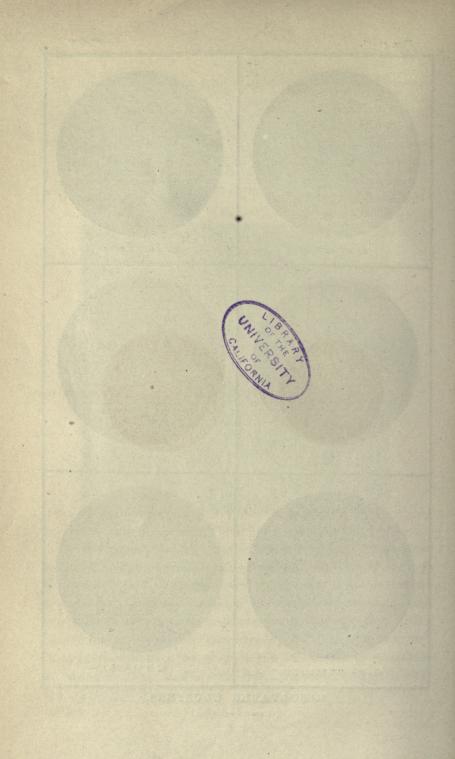
2 M AQUARII. (Earl of Rosse.)

I now pass on to another order of objects which present themselves much less clearly to our eyes than the brilliant clusters enumerated above—the nebulæ properly so called. Some of them are resolvable in large telescopes, but the greater number defy the utmost efforts made to separate them into component stars, though probably most of them are stellar. They are usually faint misty objects, many of them not unlike comets or specks of luminous fog. It has been found convenient to subdivide them into five classes, which I shall now proceed to consider briefly.

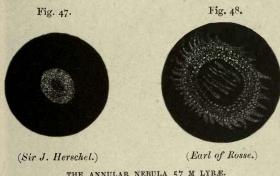


RESOLVABLE CLUSTERS.

(Drawn by Smyth.)



Of annular nebulæ the heavens afford only four examples. The most remarkable one occurs in Lyra, R.A. 18h 49m 28s, Decl. + 32°53.6′ (Messier's 57th: D 6720). It is situated about midway between the stars β and γ , and may be seen with a telescope of moderate power, a statement which can be made of no other annular nebulag. Sir J. Herschel, in his description of it, said: "It is small and particularly well defined, so as to have more the appearance of a flat oval solid ring than of a nebula. The axes of the ellipse are to each other in the proportion of about 4 to 5, and the opening occupies about half, or rather more than half, the diameter. The central vacuity is not quite dark, but is filled in with faint nebula like a gauze stretched over a hoop.



THE ANNULAR NEBULA 57 M LYRE.

The powerful telescopes of Lord Rosse resolve this object into excessively minute stars, and show filaments of stars adhering to its edges h." Chacornac also, with a 21/2-ft. reflector by Foucault, resolved this nebula into stars. Yet, in contradiction to these circumstantial details, Huggins claims that his spectroscope shows the whole to be gaseous—probably nitrogen.

The most recent account of this nebula is due to Holden. Using the great Lick Telescope he says:—"One's first idea is not so much that the aspect is unfamiliar, as that it is distinctly

g As the nebula appeared to me on Sept. 23, 1864, in an 81-in. refractor, the difference between the luminosity of the central and marginal portions of the

nebula was by no means considerable.

h Outlines of Ast., p. 644. The last sentence of this extract seems not to be accurate.

different, that its simple structure has suddenly become complex, and finally that the task of depicting it completely is practically impossible by the ordinary methods. . . . The N. end of the minor axis is much the best terminated. From the whole S. edge faint filaments of nebulosity radiate out. . . . The preceding

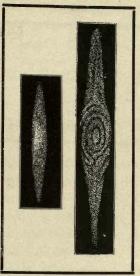
Fig. 49.



THE GREAT NEBULA IN ANDROMEDA. (G. P. Bond.)

edge of the major axis is the best terminated. There are several bright patches in the nebulosity, especially at the end of the minor axis.... Neither the outer nor the inner boundary curves of the nebula are smooth ovals. Inside the ring it is at once seen that the space on the S. and preceding side is darker than the rest i."

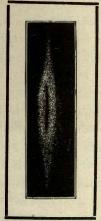
i Month. Not., vol. xlviii. p. 385. 1888.



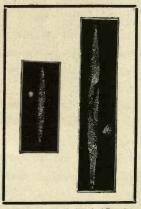
(Sir J. Herschel.) (Earl of Rosse.)

NEBULA, 65 M LEONIS.

R.A. 11^h 12^m 40^s, Decl. +13° 45.0′.



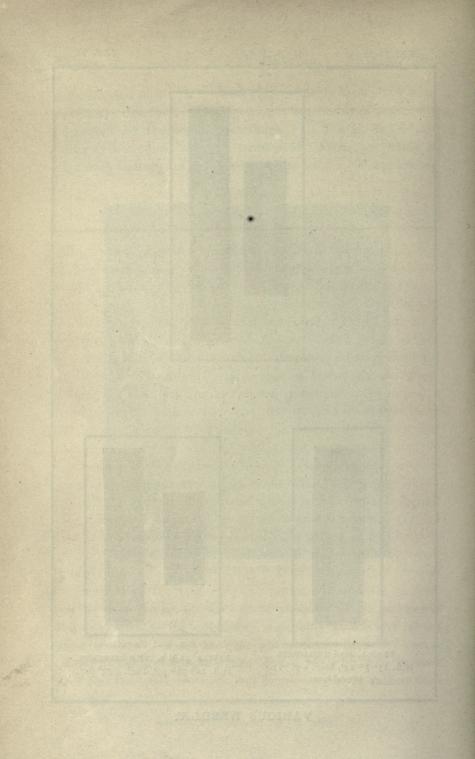
NEBULA, 4058 H DRACONIS. R.A. 15^h 3^m 24^s, Decl. + 56° 11·4'. (Earl of Rosse.)



(Sir J. Herschel.) (Earl of Rosse.)

NEBULA, 42 H v. COME BERENICES.

R.A. 12h 36m 50s, Decl. + 33° 8.8′.



Other annular nebulæ will be found as follows:-

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.	Decl. 1890.
1 2 3	4290 H Scorpii 11 拱 IV Scorpii 13 拱 IV Cygni	6369	4290 4302 4565	h. m. s. 17 14 43 17 22 39 20 11 57	-38 22.0 -23 39.4 +30 8.7

Elliptic nebulæ of various degrees of eccentricity are not uncommon; the well-known "Great Nebula in Andromeda." R.A. oh 36m 47s, Decl. +40° 40·1' (Messier's 31st: D 224), is an object of this kind. Its ellipticity is considerable; it is likewise very long, and has a bright central condensation sufficient to make it visible to the naked eye. A drawing by G. P. Bond portrays this nebula under an aspect differing much from that which it is commonly recognised as possessing. That observer traced it to a length of 4° and to a breadth of 2½°, and was the first to draw attention to the two curious black streaks, or longitudinal vacuities, which run nearly parallel to the major axis of the oval on the South side. Telescopes of large size are required to show these and other details mentioned by the American observer in question k. No telescope has yet resolved this object, though several hundred stars (shown in the annexed engraving), have been counted within its limits. Huggins has noticed its spectrum to be continuous (though cut off at the red end), and therefore whatever it is, seemingly it is not gaseous. Mr. I. Roberts has recently obtained photographs of this object which seem to combine the features exhibited by Sir J. Herschel in the engraving appended to his Outlines of Astronomy with the rifts recorded by Bond.

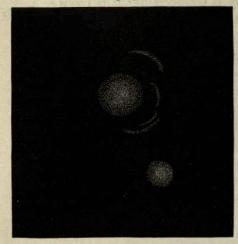
Several elliptic nebulæ are remarkable as having double stars at or near each of their foci: the nebula 4395 H Clypei Sobieskii, situated in R.A. 18^h 10^m 34^s, and Decl.—18° 54·8′, is an example.

Other elliptic nebu	læ will	be found	as follows:-
---------------------	---------	----------	--------------

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.	Decl. 1890.
I	ı ₩ V Ceti	253	138	h. m. g.	-25 53·7
2	3706 H Centauri	5367	3706	13 51 8	-39 26.6
3	4419 H Draconis	6648	4419	18 25 12	+64 53.2

The discovery of *spiral* or *whirlpool* nebulæ is due to the late Earl of Rosse. The best known is in the constellation Canes Venatici,

Fig. 55.



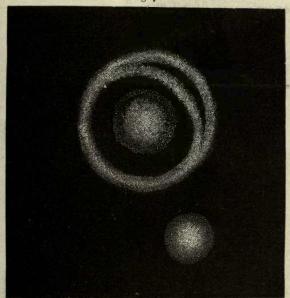
THE SPIRAL NEBULA 51 M CANUM VENATICORUM. (Smyth.)

R.A. 13h 25m 13s, Decl. +47°45'2'(Messier's 51st: D 5194). To Sir J. Herschel it presented the appearance of a large and bright globular cluster, surrounded by a ring at a considerable distance from the globe, which varied very much in brightness in its different parts, and through about two-fifths of its circumference was subdivided as if into 2 laminæ, one of which appeared turned up towards the eye out

of the plane of the rest. Near it (at about a radius of the ring distant) is a "small bright round nebula¹." In Lord Rosse's telescope the aspect of this object is entirely altered. The ring passes into a distinct spiral coil of nebulous matter, and the outlying portion is seen to be connected with the main mass by a curved band, the whole showing indications of resolvability into

stars. A small telescope utterly fails to grasp any of these features. All it can do is to exhibit a misty spot of light. Huggins finds the spectrum to be non-gaseous m.

Fig. 56.



THE SPIRAL NEBULA 51 M CANUM VENATICORUM. (Sir J. Herschel.)

Other spiral nebulæ will be found as follows:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.	Decl. 1890.
1	33 M Trianguli	598	352	h. m. s. 1 27 38	+30 6.8
2	57 H I. Leonis		1863	9 25 57	+21 59-1
3	99 M Virginis	4254	2838	12 13 13	+15 6.9
4	55 lfl I. Pegasi n	7479	4892	22 59 27	+11 43.9

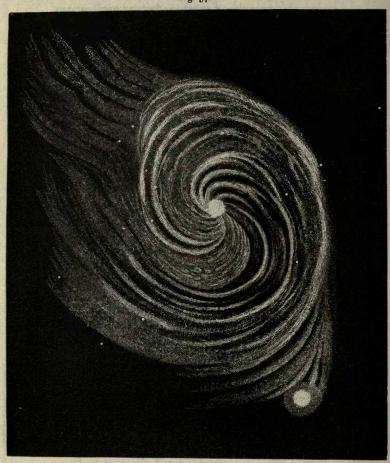
m For other drawings of this see Mem. R.A.S. vol. xxxvi. Pl. VI. Fig. 27 [not 27a] (Lassell); Scientific Trans. Roy. Dub. Soc., New Ser., vol. ii. Pl. IV. (Rosse). All these are said by Dreyer to

be much better than the one given here.

n The spiral (or annular) mass of nebula engraved in Fig. 62 post has been made by the engraver far too definite and bright.

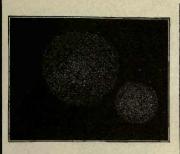
Planetary nebulæ received their name from Sir W. Herschel on account of their resembling in form the larger planets of our system. They are either circular or slightly elliptical; some have

Fig. 57.



THE SPIRAL NEBULA 51 M CANUM VENATICORUM.
(Earl of Rosse.)

well-defined outlines; in others the edges appear hazy; they are throughout uniformly bright, without any traces of nuclei. One of the most striking of this class is 97 M [D 3587] Ursæ Majoris, R.A. 11^h 8^m 19^s, Decl. + 55° 36.7′, close to the star β of that con-



(Sir J. Herschel.)

chel.) (Earl of Rosse.)
THE SPIRAL NEBULA 57 H I. LEONIS.



THE SPIRAL NEBULA 99 M VIRGINIS. (Earl of Rosse.)



(Sir J. Herschel.)



(Earl of Rosse.)

THE SPIRAL NEBULA 55 H I. PEGASI.



stellation, that is to say, 2° sf. It was discovered by Méchain in 1781, and is described as "a very singular object, circular and uniform, and after a long inspection looks like a condensed mass of attenuated light." Sir J. Herschel gave it a diameter of 2' 40"

Fig. 63.



(Sir J. Herschel.)

(Earl of Rosse). PLANETARY NEBULA, 97 M URSÆ MAJORIS.

The late Earl of Rosse detected perforations and a spiral tendency To Huggins it yields a gaseous spectrum. in it.

Other planetary nebulæ will be found as follows:-

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.		Decl. 1890.	
SUFF	BURNESHIELD IN			h. m.	8.	0	,
I	26 H IV. Eridani	1535	826	4 9	10	-13	1.3
2	39 lfl IV. Argûs	2438	1565	7 36	49	-14	29.1
3	1843 H Argûs (Car.)	2867	1843	9 18	18	-57	50.6
4	27 H IV. Hydræ	3242	2102	10 19	25	-18	5.1
5	2581 H Centauri	3918	2581	11 44	51	-56	34·I
6	297 H II. Virginis	5247	3614	13 32	7	-17	19.3
7	4234 H Herculis	6210	4234	16 39	51	+ 24	0.0
8	50 H IV. Herculis	6229	4244	16 43	56	+47	48-0
9	37 H IV. Draconis	6543	4373	17 58	35	+66	38.0
10	743 H III. Aquilæ	6781	4487	19 13	5	+ 6	14.0
11 2	51 H IV. Sagittarii	6818	4510	19 37	45	-14	24.8
12	73 H IV. Cygni	6826	4514	19 41	56	+ 50	14.7
13	т Ӈ IV. Aquarii	7009	4628	20 58	10	-11	47.7
14	18 H IV. Androm.	7662	4964	23 20	35	+41	55.2

No. 1 was described by Lassell as the most interesting and extraordinary object which he had ever seen: an 11th-mag. star standing in the centre of a circular nebula, itself placed centrally upon a larger and fainter circle of hazy light. To Huggins it yields a non-gaseous spectrum, though deficient at the red end.

No. 2 is a faint object near 46 M Argûs, which Lassell and the late Earl of Rosse found to be annular rather than strictly "planetary."

No. 4 was described by Smyth as resembling Jupiter. Secchi's large refractor at Rome entirely altered the features of this

object as seen with less powerful instruments. Spectrum, gaseous.



Fig. 65.

PLANETARY NEBULA, 297 H II. VIRGINIS. R.A. 13^h 32^m 7^s, Decl. -17° 19·3'. (Sir J. Herschel.)

No. 9 is large and bright of its class, according to Webb, and "much like a considerable star out of focus." Spectrum, gaseous. So found in 1864 by Huggins, and the first of his discoveries in this field. Some interesting conclusions have been arrived at by Holden, using the great Lick telescope. He says:—
"It bears magnifying well, losing only its characteristic and remarkable ['light

blue'] colour with the higher powers. The nebula is apparently composed of rings overlying each other, and it is difficult to resist the conviction that these are arranged in Space in the form of a true helix. Holden consequently proposes to term this a 'Helical Nebula' the first of its class."

No. 11 has been found by Huggins to exhibit a gaseous spectrum.

No. 13 is a somewhat oval and fairly bright nebula. As in so many other like instances, the "planetary" features disappear in very large telescopes. It yields a gaseous spectrum Holden describes this as a "truly wonderful object. . . . The colour is pale blue. . . . The central oval is not bounded by a smooth curve. It looks like an elastic link which has been warped, so that the preceding one-quarter appears beyond the median plane (further away from the eye); the central one-half appears

on the hither side of the median plane (nearer the eye); and the following one-quarter, again, appears to be beyond the median plane. . . . The central ring lies upon an oval of much fainter nebulosity. This outer nebulosity is fairly uniform in brightness, except that there is a defalcation of light at its S. preceding edge, and one at its N. following edge. The latter is very remarkable as seen. A dark band lies just N. of the bright central ring, and one not quite so dark lies just S. of the same ring. The two satellites preceding and following nearly in the major axis of the nebula appear to be faintly connected with the main nebula."

No. 14 is a small but bright object. Lassell noticed it to comprise a nucleus and 2 oval rings, out of which the late Earl of Rosse evolved a spiral structure. Huggins obtains a spectrum of 4 gaseous lines, the form of the nebula being annular.

Some peculiarities may be mentioned as connected with planetary nebulæ: three-fourths of those known are situated in the Southern hemisphere; they are mostly gaseous (if spectroscopy is to be relied on), and several are noticeably of a blue tinge. Among other peculiarities which characterise gaseous nebulæ it may be mentioned that they are nearly all in or close to the Milky Way. D'Arrest remarked in 1872, that of 12 undoubtedly gaseous nebulæ in the Northern hemisphere 10 are inside and only 2 outside the Milky Way as seen with the naked eye. In the Southern hemisphere, out of 20 nebulæ there are 15 inside and 5 outside the Milky Way; and of the 5 outsiders one is very close to it.

Nebulous stars are so called because they are surrounded by a faint nebulosity, usually of a circular form, and sometimes several minutes in diameter. Hind remarks that the nebulosity is, in some cases, well defined, but in other cases quite the reverse. He also says that "the stars thus attended have nothing in their appearance to distinguish them from others entirely destitute of such appendages; nor does the nebulous matter in which they are situated offer the slightest indications of resolvability into

stars with any telescopes hitherto constructed." The following stars are instances of this kind:—

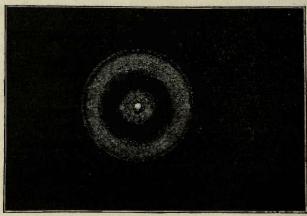
No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.	Decl. 1890.
1 2 3	ι Orionis ε Orionis 45 Η IV. Geminorum	0,000	1183 1193 1532	h. m. s. 5 30 3 5 30 38 7 22 41	5 59.0 1 16.4 +21 8.1

No. 1 is a triple star, A $3\frac{1}{2}$, B 8, and C 11, dist. 11.5" and 49", the whole being involved in a large nebulous ring 3' in diameter.

No. 2 is a 2½-mag. star, said to have been seen "involved in an immense nebulous atmosphere," but later observations by more than one observer throw doubts on the accuracy of this statement.

Nebulous star, \$\epsilon\$ contons. No. 3 is an 8th-mag. star, which, according to Sir J. Herschel, lies "exactly in the centre of an exactly round bright atmosphere 25" in diameter."

Fig. 67.



NEBULOUS STAR, 45 H IV. GEMINORUM. (Rev. H. C. Key.)

The Rev. H. C. Key q, who paid special attention to this object, described it as "a bright but somewhat nebulous star closely surrounded by a dark ring; this again by a luminous ring; then an interval much less luminous, and, finally, at some distance an exterior luminous ring,"—a description which accords well with the late Earl of Rosse's, derived from his much more powerful telescope.

Only with large telescopes can nebulous stars be scrutinised with any satisfactory result.

Besides the clusters and nebulæ belonging to the foregoing classes, there are others for the most part of irregular form and large dimensions, which it is convenient to class by themselves. Under this head may be included the following:—

No.	Name.	Dreyer.	H.'s Cat. of 1864.	R.A. 1890.	Decl. 1890.
			- T-14	h. m. s.	0 /
1	47 Toucani	104	52	0 19 9	-72 41.6
2	1 M Tauri	1952	1157	5 27 51	+ 21 56.6
3	42 M Orionis	1976	1179	5 29 52	- 5 27.7
4	30 Doradûs	2070	1269	5 39 29	-69 9.4
5	η Argûs	3372	2197	10 40 47	-59 6.5
6	κ Crucis	4755	3275	12 47 7	-59 45.2
7	ω Centauri	5139	3531	13 20 10	-46 44.3
8	20 M Sagittarii	6514	4355	17 55 41	-23 1.8
9	8 M Sagittarii	6523	4361	17 57 8	-24 22.6
10	17 M Scuti Sobieskii	6618	4403	18 14 16	-16 14.9
11	27 M Vulpeculæ	6853	4532	19 54 48	+ 22 25.0
12	4618 H Cygni	6995	4618	20 52 34	+30 33.9

The remarks which follow in inverted commas are nearly all by Sir John Herschel, though an actual reference to that effect is not in every case given.

No. 1 (47 Toucani) was described by Sir J. Herschel as "a superb globular cluster, immediately preceding the *Nubecula Minor*; it is very visible to the naked eye, and one of the finest objects

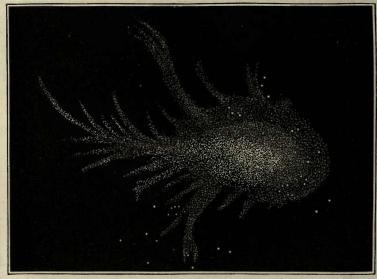
in the heavens. It consists of a very condensed spherical mass of stars, of a pale rose colour, concentrically enclosed in a much less condensed globe of white ones 15' or 20' in diameter." In his account of this cluster Sir John remarked that he could not

Fig. 68.



(Sir J. Herschel.)

Fig. 69



(Earl of Rosse.)
THE "CRAB" NEBULA IN TAURUS.

remember a single elliptical nebula which is resolvable, all the resolvable clusters being more or less circular in their outlines. "Between these 2 characters then (ellipticity of form and difficulty of resolution) there undoubtedly exists some physical connexion... It deserves also to be noticed that in very elliptic nebulæ which

have a spherical centre (as in 65 M), a resolvable or mottled character often distinguishes the central portion, while the branches exhibit nothing of the kind r."

Fig. 70.

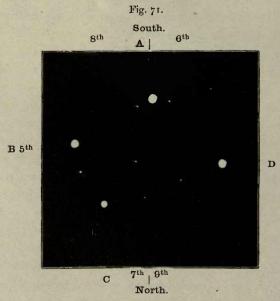


THE GREAT NEBULA IN ORION. (Tempel.)

No. 2 is frequently called the "Crab Nebula in Taurus." It has an elliptic outline in most instruments, but in Lord Rosse's

Results of Ast. Obs., p. 19. An exception to this rule is 1 M Tauri.

reflector "it is transformed into a closely-crowded cluster, with branches, streaming off from the oval boundary, like claws, so as to give it an appearance that in a measure justifies the name by which it is distinguished." This is Sir J. Herschel's paraphrase of the original observations of 1844, but by all accounts it is a veritable paraphrase because all the later Parsonstown observations seem to negative the existence of the "claws"." It was the accidental discovery of this nebula in 1758, when he



THE TRAPEZIUM OF ORION, January 1866. (Huggins.)

was following a comet, that led Messier to form his well-known Catalogue of Nebulæ, practically the first of its kind, for Halley's published in 1715 contained but 6 objects.

No. 3 is the "Great Nebula in the sword-handle of Orion," surrounding the multiple star θ in that constellation. It was mentioned by Cysatus of Lucerne as known to him in 1618, though often spoken of as discovered by Huyghens about the year 1656. "In its more prominent details may be traced some

⁸ See Trans. Roy. Dub. Soc., New Ser., vol. ii. p. 47.

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slight resemblance to the wing of a bird. In the brightest portion are 4 conspicuous stars forming a trapezium. The nebulosity in the immediate vicinity of these stars is flocculent, and of a greenish white tinge; about half a degree northward of the trapezium are 2 stars involved in a bright branching nebula of singular form, and southward is the star & Orionis, also situated in a nebula. Careful examination with powerful telescopes has traced out a continuity of nebulous light between the great nebula and both these objects, and there can be but little doubt that the nebulous region extends northwards as far as ϵ in the belt of Orion, which is involved in a strong nebulosity, as well as several smaller stars in the immediate neighbourhood." Secchi, in fact, says that the nebulous mass in Orion has, speaking roughly, a triangular outline with a base of about 4°, and a height of about 5½°, reaching downwards from ζ, the apex (with a break, however, at σ), almost as far as vt. The "Trapezium" of stars in this nebula deserves a few additional words on its own account. Four stars were long known. In 1826 W. Struve found a 5th, and four years later Sir J. Herschel a 6th. Since then other stars have been seen with more or less certainty, and Huggins puts up the total number to 9, as in the engraving on p. 86. Numerous observations by different astronomers, at different dates, and with instruments of widely different size and character, are only explicable on the supposition that most of the smaller stars of the Trapezium are variable. The 4 brightest stars are respectively of mags. 6, 7, 7½, and 8. All the rest are much smaller. Much controversy has taken place respecting the existence of stars in the Trapezium beyond the familiar 6, and Burnham and other American observers have plainly asserted that no more than 6 exist which can be seen in any telescope smaller than

t See Struve, Month. Not., vol. xvii. pp. 225-30, June 1857; W. C. Bond, Mem. Amer. Acad., vol. iii. New Series, p. 87; Sir J. Herschel, Results of Ast. Obs., pp. 25-32; Outlines of Ast., p. 650; Secchi, Month. Not., vol. xviii. p. 8, Nov. 1857; G. P. Bond, ibid., vol. xxi. p. 203,

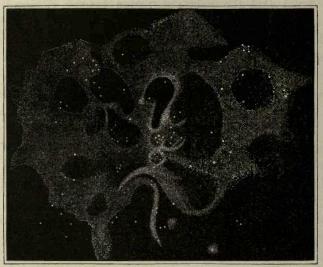
May 1861; Liapounov, ibid., vol. xxiii. p. 228, May 1863; Washington Observations, 1878, App. I., for various remarks on this nebula.

u See for some of these Huggins's paper on the subject in *Month. Not.*, vol. xxvi. p. 71. Jan. 1866.

the Lick 36-inch*. The discordant opinions may however be reconcileable on the supposition that all the interior stars are variable.

No. 4 (30 Doradûs) is a singular nebula, faintly visible to the naked eye, situated within the limits of the *Nubecula Major*; it was noticed by La Caille as resembling the nucleus of a comet, and is one of the most singular and extraordinary objects in the heavens.





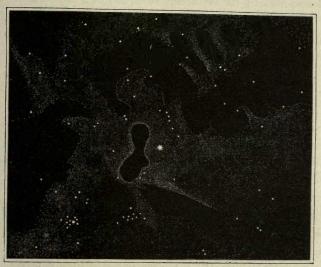
THE NEBULA 30 DORADÛS. (Sir J. Herschel.)

No. 5 is a very large nebula surrounding the star η Argûs, and occupying a space equal to about 5 times the area of the Moon. Sir J. Herschel, who carefully examined this object when he was at the Cape of Good Hope in 1833 and following years, said that "viewed with an 18-inch reflector no part of this strange object shows any sign of resolution into stars, nor in the brightest and most condensed portion, adjacent to the singular oval vacancy in the middle of the figure, is there any of that curdled appearance, or that tendency to break up into bright knots with intervening

^{*} Month. Not., vol. xlix. p. 352. April 1889.

darker portions, which characterise the nebula of Orion, and indicate its resolvability. It is not easy for language to convey a full impression of the beauty and sublimity of the spectacle which this nebula offers, as it enters the field of the telescope (fixed in R.A.) by the diurnal motion, ushered in as it is by so glorious and innumerable a procession of stars, to which it forms a sort of climax y." Some recent observations on a

Fig. 73.



THE NEBULA SURROUNDING η ARGÛS. (Sir J. Herschel.)

point of great importance concerning this nebula will be alluded to hereafter.

No. 6. The cluster surrounding κ Crucis was described by Sir J. Herschel as one of the most beautiful objects of its class: it consists of about 110 stars from the 7th magnitude downwards, 8 of the more conspicuous of them being coloured various shades of red, green, and blue. The accompanying plate is the result of observations made by Mr. H. C. Russell at Sydney, N. S. W., in March and April 1872. The lines on the edges of the en-

⁹ Sir J. Herschel, Outlines of Ast., p. 652; see also Results of Ast. Obs., pp. 32-47.

graving represents scales of distance reckoned from the principal star. Mr. Russell remarks that "many of the stars have drifted" since the drawing by Sir J. Herschel was made, and he has seen 25 stars not noted by Herschel, although using a smaller telescope than the Cape one. "The colours of this cluster are very beautiful, and fully justify Herschel's remark that it looks like a 'superb piece of fancy jewellery z'."

No. 7 (ω Centauri) is visible to the naked eye, and resembles a tail-less comet: its brilliancy is about equal to that of a 4½-magnitude star, but, "viewed in a powerful telescope, it appears as a globe of fully 20′ in diameter, very gradually increasing in brightness to the tentre, and composed of innumerable stars of the 13th and 15th magnitudes^a."

No. 8 (20 M Sagittarii) is the chief member of an important group of nebulæ. "One of them [1991 h] is singularly trifid, consisting of 3 bright and irregularly formed nebulous masses, graduating away insensibly externally, but coming up to a great intensity of light at their interior edges, where they enclose and surround a sort of three-forked rift or vacant area, abruptly and uncouthly crooked, and quite void of nebulous light. A beautiful triple star is situated precisely on the edge of one of these nebulous masses, just where the interior vacancy forks out into two channels b."

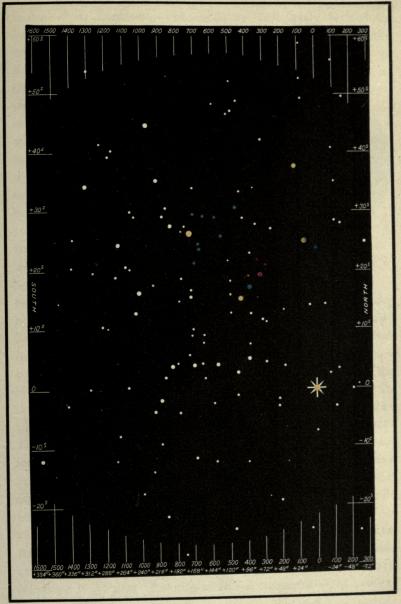
No. 9 (8 M Sagittarii). "A collection of nebulous folds and masses, surrounding and including a number of oval dark vacancies, and in one place coming up to so great a degree of brightness as to offer the appearance of an elongated nucleus. Superposed upon this nebula, and extending in one direction beyond its area, is a fine and rich cluster of scattered stars, which seem to have no connexion with it, as the nebula does not, as in the region of Orion, show any tendency to congregate about the stars." Webb describes this as a "splendid galaxy object visible to naked eye."

² Month. Not., vol. xxxiii. p. 66, Dec. 1872.

a Sir J. Herschel, Outlines of Ast., p. 637; see also Results of Ast. Obs., p. 21.

b Sir J. Herschel, Outlines of Ast., p. 653.

o Outlines of Ast., p. 654.



THE CLUSTER NEAR & CRUCIS.



No. 10 is frequently but not very judiciously termed the "Horse-shoe nebula" from a certain peculiarity in its form: this

name, however, can only be applied to the most prominent portion, for there is an important outlier; and when this is seen, and also the bright lens-like band which unites it with the principal mass, the whole object resembles a pair of capital Greek omegas connected at their bases. In ordinary telescopes the outline resembles that of a swan minus its legs! Huggins finds it to be gaseous.



THE NEBULA 17 M CLYPEI SOBIESKII. (Chambers.)

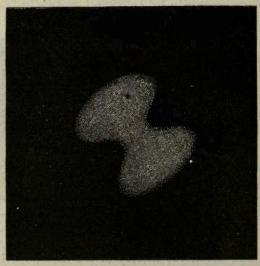
Holden has investigated with much care and detail the history of this nebula between 1833 and 1875 as recorded in numerous drawings by Sir J. Herschel, Lamont, Mason, Lassell, Trouvelot and himself. As a final result he concludes that "the drawings, whether taken as a whole, or considered according to their relative importance, show that the 'Horse-shoe' has moved with reference to the stars [in the nebula], while the Messierian streak has not moved; and that, therefore, we have evidences of a change going on in the nebula. This may be a veritable change in the structure of the nebula itself, such as was suspected by Schröter, confirmed by O. Struve, and again confirmed by myself in the nebula of Orion; or it may be the bodily shifting of the whole nebula in space, in some plane inclined to the line of sight^d."

No. 11 is a curious object near the 5th-magnitude star 14 Vulpeculæ; it is shaped like a double-headed shot, or dumb-bell, and is usually known as the "Dumb-bell" nebula. In a small telescope it appears like two roundish nebulosities, in contact

looked up by the possessors of large telescopes. (Sidereal Messenger, vol. iv. p. 38. March 1885.)

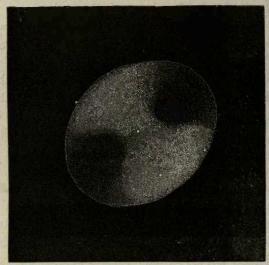
d American Journ. Arts and Sc., 3rd Ser., vol. xii. p. 360. June 1876. Swift has given a sketch and some descriptive notes on this nebula which deserve to be

the one with the other, or nearly so. Sir J. Herschel saw it Fig. 76.



THE "DUMB-BELL" NEBULA IN VULPECULA. (Smyth.)





THE "DUMB-BELL" NEBULA IN VULPECULA. (Sir J. Herschel.)

with "an elliptical outline of faint light enclosing the two chief

masses," but Lord Rosse's reflectors materially change the appearance of the object: his 3-ft. reflector destroys the regular elliptic outline seen by Sir J. Herschel, and his 6-ft. instru-

Fig. 78.



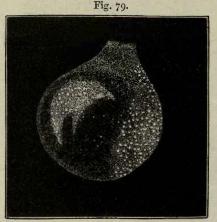
THE "DUMB-BELL" NEBULA IN VULPECULA.

(Earl of Rosse: 3-ft. Reflector.)

ment makes the general outline to resemble that of a chemical retort, and reveals many stars. The history of the successive stages in the observation of this nebula affords a striking comment on the "Nebular Hypothesis," which was so much under discussion a few years ago.

No. 12 (4618 H Cygni). "A most wonderful phenomenon. A very large space, 20' or 30' broad in P.D. and 1^m or 2^m in R.A., full of nebula and stars mixed. The nebula is decidedly attached to the stars, and is as decidedly not stellar. It forms irregular lacework marked out by stars, but some parts are decidedly nebulous, wherein no stars can be seen."

In the Southern hemisphere, and not far from the Pole, are the Magellanic clouds, or *Nubeculæ Major* and *Minor*, so called



THE "DUMB-BELL" NEBULA IN VULPECULA . (Earl of Rosse: 6-ft. Reflector.)

from their cloud-like appearance. The former is situated in the constellation Dorado, and the latter in Toucan. They are of a somewhat oval shape, and are both visible to the naked eye when the Moon is not shining; but the smaller disappears in strong moon-light. Sir J. Herschel, when at the Cape, examined these remarkable objects with his large telescope, and described them as consisting of swarms of stars, clusters, and nebulæ of every description. The larger one covers an area of about 42 square degrees, and the smaller of 10 square degrees.

e This illustration (from Phil. Trans., vol. cxl.) is described by Dreyer as "outrageous." On the other hand, he says that

the illustration in *Phil. Trans.*, vol. cli. is "very good and agrees well with those of other observers."

The nebulæ are very far from being uniformly distributed in the heavens, but congregate especially in a zone crossing at right angles the Milky Way. They are exceedingly abundant in the constellation Virgo. Sir J. Herschel's Catalogue of 1864 contains 5079 of these objects, which are thus distributed through the different hours of R.A.:—

0]	Hour		 211	Neb.			XIII	Hour	 	686	Neb.
I	,,	•	 278	,,	Marin I		XIII	,,	 	252	,,
II	,,		 161	,•			XIV	,,	 	263	:2
III	,,		 163	,,			XV	:,	 	114	,,
IV	29		 198	"			XVI	,,	 	109	,,
V	,,		 352	,,		arti.	XVII	,,	 	108	,,
VI	,,		 139	,,			XVIII	,,	 	92	"
VII	,,		 132	,,			XIX	:,	 	79	,,
VIII	,,		 135	,,		-	XX	,,	 	90	"
IX	,,,		 252	,,		400	XXI	,,	 	120	,,
X	,,		 294	,,			XXII	,,	 	142	,,
XI	,,		 421	,,			XXIII	,,	 	163	"

On the distribution of the nebulæ^f, Guillemin remarks as follows:—

"This is very unequal in the Northern hemisphere, and in those parts of the Southern one visible in the Northern temperate zone. The greatest number is found in a zone which scarcely embraces the eighth part of the heavens. The constellations Leo, Ursa Major, Camelopardus, Draco, Boötes, Coma Berenices, and Canes Venatici, but principally Virgo, form this zone, which extends as far as the middle of Centaurus: it is known under the name of the nebulous region of Virgo. Nearly at the opposite pole of the sky, another agglomeration of nebulæ embraces Andromeda, Pegasus, and Pisces, and extends lower than the first-named constellation into the Southern heavens.

"It is noteworthy that the regions nearest the Milky Way are the poorest in nebulæ, whilst the two richest regions lie at the two poles of that great belt in which the stars are so numerous and condensed. The nebulæ are more uniformly spread over the zone which surrounds the South Pole; they are at the same

f Readers interested in this matter should study an elaborate paper by C. Abbe in *Month. Not.*, vol. xxvii. p. 257 (May 1867), followed by others by

R. A. Proctor in *Month. Not.*, vol. xxix. p. 357 (Oct. 1869); and by S. Waters in *Month. Not.*, vol. xxxiii. p. 558 (Oct. 1873).

time much less numerous. On the other hand, there are two magnificent regions there, which alone contain nearly 400 nebulæ and star-clusters g."

In connection with the distribution of the nebulæ it may here be mentioned that almost all the nebulæ indicated by the spectroscope to be gaseous are situated either within or on the borders of the Milky Way, whilst in the regions near the poles of the Milky Way such nebulæ are wanting, though of other nebulæ there is no lack there. These facts may hereafter prove to be of great significance.

The first who paid much attention to clusters and nebulæ was the French astronomer Messier, who formed the well-known and important, though small Catalogue, the constituents of which are still distinguished by his initial—M. After him came Sir W. Herschel, who classified the nebulæ which he observed in the following way:—

I. "Bright nebulæ"—288 objects.

II. "Faint nebulæ"—909 objects.

III. "Very faint nebulæ"-984 objects.

IV. "Planetary nebulæ, stars with bars, milky chevelures, short rays, remarkable shapes," &c.—79 objects.

V. "Very large nebulæ"—52 objects.

VI. "Very compressed rich clusters"-42 objects.

VII. "Pretty much compressed clusters"—67 objects.

VIII. "Coarsely scattered clusters"—88 objects. Grand total:—2509.

Objects catalogued by this observer are usually indicated by the symbol H, with the number of the class in Roman capitals; thus:—33 H VI. Persei. References to Sir John Herschel's Catalogue of 1833, and his Cape extension of it, are indicated by the letter "h" with the number prefixed. For Sir John Herschel's combination Catalogue of 1864, "H" has been taken as the designating letter in this volume. A large and important reconstruction of that Catalogue was published by Dreyer in 1888, and there can be no doubt that this (which contains 7840 objects) will be the standard Catalogue for many years to come.

The other observers who must be cited as having devoted

g The Heavens, Eng. ed., p. 395.

h Mem. R.A.S., vol. xlix.

much attention to nebulæ and clusters are the late Earl of Rosse and Dreyer in Ireland, and MM. D'Arrest, Schönfeld, Schultz and Stéphan on the Continent. The late Earl of Rosse laid before the Royal Society, in 1861, a large and valuable Catalogue of 989 nebulæ observed by himself at Parsonstown; and his son, the present Earl, has developed his father's efforts by observations since brought together in a valuable and important catalogue communicated in 1878 to the Royal Dublin Society. Some further information respecting the work done of late years in this branch of sidereal astronomy may be gleaned from the list of Catalogues.

The following abbreviations relate to words which were made special use of by Sir J. Herschel in his Catalogues of Nebulæ, and as they have been adopted by various observers writing in various languages, a statement of Sir John's terminology will frequently be found useful m:—

```
about.
ab
alm
     almost.
am
      among.
     appended.
app
att
      attached.
B
      bright.
b
      brighter.
bet
      between.
biN bi-nuclear.
      brightest towards the North side.
bn
bs
      brightest towards the South side.
     brightest towards the preceding side.
bp
      brightest towards the following side.
bf
C
      compressed.
      considerably.
      coarse, coarsely.
co
```

```
diffic difficult.
dif
      diffused.
dist
      distance, distant.
def
      defined.
E
     extended.
      extremely.
      excessively.
      easily resolveable.
er
      excentric.
exc
F
      faint.
f
      following.
      gradually.
g
      group.
gr
      involved.
inv
i
      irregular.
iF
      irregular Figure.
L
      large.
      long, or little.
M
      in the middle.
      much.
m
mm mixed magnitudes.
```

cluded a few words which are of limited applicability, and I have varied the order a little in some cases to facilitate reference. These designations were first given in Sir J. Herschel's 1833 Catalogue. (Phil. Trans., vol. exxiii. p. 359.)

Soc., New Ser., vol. ii. 1880.

* Scientific Transactions, Roy. Dublin

Phil. Trans., vol. cli. p. 681.

com cometic.

cl

D

cont in contact.

cluster.

double.

diameter.

¹ See vol. ii. p. 500.

m This table has been taken from his General Catalogue, p. 11, but I have ex-

			A STATE OF THE PARTY OF THE PAR
mn	milky nebulosity.	sev	several.
N	nucleus, or to a nucleus.	susp	suspected.
neb	nebula.	sh	shaped.
nr	near.	stell	stellar.
n	North.	sw	sweep.
np	north preceding.	tri-N	tri-nuclear.
nf	north following.	trap	trapezium.
P	poor.	v	very.
p	pretty (before F, B, L, S, &c.);	vv	very exceedingly.
	otherwise, it means preceding.	(moon above the horizon.
pg	pretty gradually.	"	moon very bright.
pm	pretty much.	*	star.
ps	pretty suddenly.	*10	a star of the 10th magnitude.
pos	angle of position.	**	double star.
R	round.	* *	triple star.
RR	exactly round.	1	a remarkable object.
Ri	rich.	11	very much so.
r	resolvable, barely (mottled as if	111	a magnificent or otherwise exceed-
	with stars).		ingly interesting object.
rr	partially resolved-same stars vi-	?	doubtful.
	sible.	33	very doubtful either as to accuracy
rrr	well resolved-clearly seen to con-	B = L	of place or reality of existence.
	sist of stars.	Δ	Dunlop; or forms a triangle with.
S	small.	0	globular cluster.
sın	smaller.	0	planetary nebula.
8	south, suddenly.	•	annular nebula.
sp	south preceding.	st. o	stars from the 9th (or other) mag-
sf	south following.		nitude downwards.
st	stars.	st. o.	13 stars from the 9th down to the
sc	scattered.	,	13 th magnitude.
C		c 11	
2	ir I Harachal adopted the	tolla	wine goolog of brightness

Sir J. Herschel adopted the following scales of brightness, size and form:—

1.	Excessively faint	excessively small;	3" to 4" diam.
2.	Very faint	very small	10" to 12" diam.
3.	Faint	small	20" to 30" diam.
4.	Considerably faint	considerably small	20 00 30 diam.
5.	Pretty faint	pretty small	50" to 60" diam.
6.	Pretty bright	pretty large	50 to 00 than.
7.	Considerably bright	considerably large	3' to 4' diam.
8.	Bright	large	5 10 4 diam.
9.	Very bright	very large	8' to 10' diam.
10.	Excessively bright	excessively large	20' and upwards.

On this Dreyer remarks:—"In estimating clusters of well-separated and scattered stars a wider acceptation must be understood, so that, e.g. a cluster of 1' in extent would be very small, and one of 15' or 20' large.

CHAPTER V.

VARIABLE NEBULÆ.

Variable Nebula in Taurus.—Observations by Hind.—Variable Nebula in Scorpio.—
Observations by Pogson and others.—Notes of observations on the other Nebula
suspected to be variable.—The controversy respecting the nebula surrounding
η Argás.

CURIOUS and interesting as are those stars which undergo periodical changes of brilliancy, it seemed at one time not unlikely that we should have to accept the idea that they do not stand alone, but that variations sometimes occur in the light of nebulæ more or less analogous in character to those already recognised in the case of numerous single stars. Subsequent consideration of the available evidence, however, leaves the matter in great doubt, and it cannot be said that any periodical changes have yet been proved in the case of nebulæ. So much as is known on the subject will however now be set out.

The following is a summary of a communication by Hind. On Oct. 11, 1852, that observer discovered, at the Regent's Park Observatory, a small nebula about 1' in diameter, with a central condensation of light. Its position (reduced to 1860) was R.A. 4^h 13^m 47^s , and Decl. $+19^\circ$ $11^\circ2'$, and therefore it was in the constellation Taurus, about $1\frac{1}{2}^\circ$ distant from ϵ .

From 1852 to 1856 a star of the 10th magnitude almost touched the *nf* edge of the nebula; this star was first noticed on the night of the discovery of the nebula, and from the fact that it had escaped observation on many previous occasions when

^a See on this subject as a whole an important paper by Dreyer, Month. Not., vol. xlvii. p. 412. May 1887.

the same locality had been under examination, Hind was induced to suspect its variability—a suspicion which eventually was shown to be well-founded, as the star afterwards dwindled down to the 12th mag. But the most singular thing remains to be told: namely, that on Oct. 3, 1861, D'Arrest, of Copenhagen, found that the nebula had totally vanished. This statement was not credited at the time on account of its apparent improbability, notwithstanding the known reputation of the observer who made it; and it was assumed, too hastily, that some error of observation had crept in, though D'Arrest's good faith was not at all questioned. Let it be noted, moreover, that a small nebula 4' preceding Hind's was seen in 1868 by O. Struve, was verified by D'Arrest shortly afterwards, and has now disappeared.

On Jan. 26, 1862, Le Verrier turned the large equatorial of the Paris Observatory (of 12.4 inches aperture) on the place of the nebula; not a single trace, however, could be obtained of it either by Le Verrier or by his assistant, Chacornac, and on the following night Secchi, at Rome, was similarly unsuccessful; thus was confirmed beyond a doubt the statement of D'Arrest. Chacornac, whilst engaged in 1854 in forming a chart of the stars in the neighbourhood of the nebula, saw it, but in going over the locality again in 1858, with a much more powerful instrument, he did not see it, though the reason why he did not announce the disappearance is not known.

Hence Hind infers that the disappearance of the nebula took place either during 1856 or during the following year. He further remarks: "How the variability of a nebula and a star closely adjacent is to be explained, it is not easy to say in the actual state of our knowledge of the constitution of the sidereal universe. A dense but invisible body of immense extent interposing between the Earth and them might produce effects which would accord with those observed; yet it appears more natural to conclude that there is some intimate connexion between the star and the nebula upon which alternations of visibility and invisibility of the latter may depend. If it be allowable to suppose that a nebula can shine by light reflected from a star,

then the waning of the latter might account for the apparent extinction of the former; but in this case it is hardly possible to conceive that the nebula can have a stellar constitution."

On Dec. 29, 1861, the nebula was again seen in the 15-inch refractor at Pulkova, and by March 22, 1862, it had so far increased in brightness as to bear a faint illumination. But on Dec. 12, 1863, Hind and Talmage carefully looked for it with the telescope with which it was originally observed, and failed to establish any trace of its visibility. The telescope in question (Mr. Bishop's) has only half the aperture of the one at Pulkova.

It is satisfactory to know that the preceding instance does not altogether stand alone, but that something at least analogous is on record. In the autumn of 1860 Mr. N. Pogson, then assistant at the Hartwell Observatory, and now Director of the Madras Observatory, communicated to the Royal Astronomical Society a paper, of which the following is the substance.

The 80th object in Messier's Catalogue of Nebulæ, although described as a compressed cluster, had always presented to Pogson the appearance of a well-defined nebula, and as it was in the same field of view with R and S Scorpii, had frequently come under his notice. On May 28, 1860, when seeking for these two variables, neither of which was then visible, his attention was arrested by the startling fact, that a star of about the 7th mag. was in the place previously occupied by the nebula. The power used was 118 on the Hartwell equatorial; and so recently as May 9 (the last night on which R Scorpii was visible) Pogson saw the nebula, and is positive that it appeared exactly the same as usual, without anything stellar about it, the selfsame instrument and power being employed. On June 10, with a power of 66, the stellar appearance had nearly vanished, but the cluster still shone with unusual brilliancy, and with a marked central condensation. Pogson's remarkable observations

b Letter in the *Times*, Feb. 4, 1862. See a further communication in *Month*. *Not.*, vol. xxiv. p. 65, Jan. 1864, and

D'Arrest's paper in Ast. Nach., vol. lvii. No. 1366, June 26, 1862.

were fully confirmed by the independent testimony of E. Luther and Auwers. The last-named observer first saw the star on May 21, 1860 d.

Pogson concludes with the following remarks:—"It is therefore incontestably proved, upon the evidence of three witnesses, that between May 9 and June 10 [1860] the cluster known as 80 Messier changed apparently from a pale cometary-looking object to a well-defined star, fully of the 7th magnitude, and then returned to its usual and original appearance. It seems to me absurd to attribute this phenomenon to actual change in the cluster itself, but it is very strange if a new variable star, the third in the same field of view, should be situated between us and the centre of the cluster. Should such be the true explanation, the midway variable star must be similar in nature, but of greater range, than Mr. Hind's wonderful U Geminorum. The cluster should be closely watched e."

On June 1, 1869, Schönfeld thought he saw some trace of the star, but no further information is on record. I looked for it but failed to see it on July 29, 1885, with a 6-inch refractor.

On Sept. 1, 1859, H. P. Tuttle discovered a nebula in Draco (D. 6643, Position for 1890, R.A. 18^h 22^m 44^s, Decl. + 74° 31·2′), which D'Arrest and others stated to be so bright as to make it inexplicable how it should have escaped the notice of Sir W. and Sir J. Herschel, if it had always been of uniform brilliancy. D'Arrest described this nebula as oval, 2′ long and 1′ 20″ broad. Dreyer thinks that this nebula ought not to be included here, on the ground that its having escaped the notice of the Herschels proves very little, because neither of those 2 astronomers paid much attention to the North Polar regions of the heavens.

On Oct. 19, 1859, Tempel observed in Taurus an object which he took to be a new telescopic comet. The next evening, however, finding it still in the same position, he was able to determine that it was not a comet, but a nebula f. On Dec. 31, 1860, it

^c Ast. Nach., vol. liii. No. 1267. July 1860.

^d Ast. Nach., vol. exiv. No. 2715. March 6, 1886.

^e Month. Not., vol. xxi. p. 32. Nov. 1860.

^f Ast. Nach., vol. liv. No. 1290. Jan. 10, 1861.

was seen again by Tempel and Pape, though with some difficulty. Auwers, who has also seen it, describes it as triangular in form, and 15' in extent, but he thinks that it might have escaped notice owing to its proximity to a bright star—Merope, one of the Pleiades. Schiaparelli, at Milan, trying a new telescope on Feb. 25, 1875, saw this nebula very clearly, and was much surprised at its size. He noted it to extend from the star Merope, beyond Electra and as far as Celænog. It may be added that Hind states that he has often suspected nebulosity about some of the smaller outlying stars of the Pleiades. The position of this nebula (which is 1435 D.) is R.A. 3h 39m 38s, and Decl. +23° 25.5' (1890). Its variability seems not clearly established.

On October 19, 1855, Chacornac discovered a nebula also in Taurus, which had not been previously observed. This object, which is D. 1988, Position for 1890, R.A. 5^h 30^m 51^s, Decl. +21° 6.4′, was so conspicuous that he felt some difficulty in understanding how it could have escaped earlier notice if it had always possessed the same brilliancy h. Dreyer however states, on the authority of Tempel, that this nebula is a myth; that is to say, that it arose from a false image of the star in Chacornac's telescope.

The foregoing observations may be said to have relation to objects of small size, but there are some slight grounds for the opinion that there is one example of a large and important nebula having undergone changes of form. The great nebula in Argo, when observed by Sir J. Herschel in 1838, contained within its area a vacuity of considerable size. The star η , then of the 1st magnitude, was situated in the most dense part of the nebula, and was completely encompassed by nebulous matter. In 1863, according to Abbott of Hobart-Town, the star, which had

⁸ As'. Nach., vol. lxxxvi. No. 2045, July 10, 1875. A translation appears in Ast. Reg., vol. xiii. p. 194, Aug. 1875. Further observations by Tempel, together with a lithograph, will be found in Month. Not., vol. xl. p. 622, 1880. It is to be noted however that according to Tempel's

sketch the nebula trends away to the S. quite in the opposite direction to Electra and Cæleno, and therefore Tempel is in conflict with Schiaparelli. Tempel however was a very careful artist.

h Bulletin Méteorologique, April 28, 1863.

dwindled down to the 6th magnitude (a matter already alluded to ⁱ), was entirely free from nebulosity. This observer also stated ^k that the outline of the vacuity was materially different from the representation given by Herschel. Mr. E. B. Powell, of Madras, confirmed these remarks generally, but also stated that the nebula as a whole had varied much in brilliancy during the time it had been under his notice ¹.

Consequent on the publication of Abbott's several communications, Capt. J. Herschel in India and Dr. Gould at Cordoba in South America directed their attention to this nebula in 1868 and following years. Capt. Herschel's own observations were compared by himself^m, by Sir J. Herschelⁿ, by Sir G. B. Airy o, and Mr. Lassell with Sir John Herschel's observations at the Cape in 1834, &c., and with Abbott's comments thereon, and the general opinion of astronomers may be gathered from the Report of the Council of the Royal Astronomical Society of 1872, where Dr. Gould's words are quoted with evident approval p. That observer had stated that he was strongly impressed "with the conviction that the alleged change is altogether imaginary," and astronomers are now agreed to pass an unfavourable opinion on Mr. Abbott's assertions q. The most recent detailed observations of this nebula are due to C. E. Peek, who carefully studied it in November and December, 1882, with a 6-inch refractor. He thus summarises his conclusions: "I am aware that recent observers have described and delineated it as completely changed since the days of Sir John Herschel; but so far as I was able to perceive, its details agree in a remarkable manner with his plate r."

i See p. 88, ante.

k Month. Not., vol. xxi. p. 230, June 1861; vol. xxiv. p. 5, Nov. 1863; vol. xxv. p. 192, April 1865; vol. xxviii. p. 200, May 1868; and vol. xxxi. p. 226, June 1871. Sir J. Herschel's earliest comment on Abbott's statements will be found in vol. xxviii. p. 225, June 1868.

¹ Month. Not., vol. xxiv. p. 171, May 1864.

m Month. Not., vol. xxix. p. 82, Jan. 1860.

n Month. Not., vol. xxix. p. 84, Jan. 1869; vol. xxxi. p. 228, June 1871.

o Month. Not., vol. xxxi. p. 233, June 1871.

^p Month. Not., vol. xxxii. p. 178, Feb. 1872.

^q See, for instance, a memorandum by Proctor in *Month. Not.*, vol. xxxii. p. 62, Dec. 1871.

^r Astronomical Observations, 1882-85, by C. E. Peek. 4to. Lond. 1886.

CHAPTER VI.

THE MILKY WAY a.

Its course amongst the stars described by Sir J. Herschel.—The "Coal Sack" in the Southern Hemisphere.—Remarks by Sir W. Herschel as to the prodigious number of stars in the Milky Way.—Computation by Sir J. Herschel of the total number of stars visible in an 18-inch reflector.—Terms applied to the Milky Way by the Greeks.—By the Romans.—By our ancestors.

POREMOST amongst the clusters of stars which we see in the heavens stands the Milky Way, which has pre-eminently occupied the attention of philosophers from the earliest ages of antiquity.

The course of the Milky Way amongst the constellations is well sketched by Sir J. Herschel, whose description I shall give, with a few verbal alterations ^b.

Neglecting occasional deviations, and following the line of its greatest brightness as well as its varying breadth and intensity will permit, its course conforms nearly to that of a great circle inclined at an angle of about 63° to the equinoctial, and cutting that circle in R.A. 6h 47m, and 18h 47m; so that its Northern and Southern poles respectively are situated in R.A. 12h 47m, Decl. N. 27° and R.A. 0h 47m, Decl. S. 27°. Throughout the region where it is so remarkably subdivided this great circle holds an intermediate situation between the two great streams; with a nearer approximation, however, to the brighter and continuous stream than to the fainter and interrupted one. If

Parsonstown, presented to the Royal Astronomical Society in 1889 a very beautiful and elaborate series of drawings of the Milky Way which deserve notice.

b Outlines of Ast., p. 569.

^a An extremely interesting article on the Milky Way by J. C. Houzeau will be found in the *Annuaire de l'Obser*vatoire de *Bruxelles*, 1880, p. 233. Mr. Böddicker, Lord Rosse's assistant at

we trace its course in order of Right Ascension, we find it traversing the constellation Cassiopeia, its brighter part passing about 2° North of the star δ of that constellation, i.e. in about 62° of North Declination. Passing thence between γ and ε Cassiopeiæ, it sends off a branch to the south-preceding side, towards a Persei, very conspicuous as far as that star, prolonged faintly towards ϵ of the same constellation, and possibly traceable towards the Hyades and Pleiades as remote outliers. The main stream, however (which is here very faint), passes on through Auriga, over the 3 remarkable stars ϵ , ζ , η of that constellation preceding Capella (a Aurigæ), and called the Hædi, between the feet of Gemini and the horns of the Bull (where it intersects the ecliptic, nearly in the solstitial colure), and thence over the club of Orion to the neck of Monoceros, intersecting the equinoctial in R.A. 6h 54m. Up to this point, from the offset in Perseus, its light is feeble and indefinite, but thenceforward it receives a gradual accession of brightness, and when it passes through the shoulder of Monoceros, and over the head of Canis Major, it presents a broad, moderately bright, very uniform, and, to the naked eye, slender stream up to the point where it enters the prow of the ship Argo, nearly in the Southern Tropic. Here it again subdivides (about the star m Puppis), sending off a narrow and winding branch on the preceding side as far as y Argûs, where it terminates abruptly. The main stream pursues its southward course to the 33rd parallel of South Declination, where it diffuses itself broadly and again subdivides, opening out into a wide fan-like expanse, nearly 20° in breadth, formed of interlacing branches, all of which terminate abruptly, in a line drawn nearly through λ and γ Argûs.

At this place the continuity of the Milky Way is interrupted by a wide gap, and when it recommences on the opposite side it is by a somewhat similar fan-shaped assemblage of branches which converge upon the bright star η Argûs. Thence it crosses the hind feet of the Centaur, forming a curious and sharply-defined semi-circular concavity of small radius, and enters the Cross by a very bright neck or isthmus not more than 3° or 4°

in breadth—this is the narrowest portion of the Milky Way. After this it immediately expands into a broad and bright mass, enclosing the stars α and β Crucis, and β Centauri, and extending almost up to a of the latter constellation. In the midst of this bright mass, surrounded by it on all sides, and occupying about half its breadth, occurs a singular dark pear-shaped vacancy, so conspicuous and remarkable as to attract the notice of the most superficial gazer, and to have acquired, amongst the early Southern navigators, the uncouth but expressive appellation of the "Coal Sack." In this vacancy, which is about 8° in length and 5° in breadth, only one very small star visible to the naked eye occurs, though it is far from devoid of telescopic stars, so that its striking blackness is simply due to the effect of contrast with the brilliant ground with which it is on all sides surrounded. This is the place of the nearest approach of the Milky Way to the South Pole. Throughout all this region its brightness is very striking, and when compared with that of its more Northern course, already traced, conveys strongly the impression of greater proximity, and would almost lead to a belief that our situation as spectators is separated on all sides by a considerable interval from the dense body of stars composing the Galaxy, which in this view of the subject would come to be considered as a flat ring of immense and irregular breadth and thickness, within which we are eccentrically situated, nearer to the Southern than to the Northern part of its circuit.

At a Centauri the Milky Way again subdivides, sending off a great branch of nearly half its breadth, but which thins off rapidly at an angle of about 20° with its general direction towards the preceding side to η and d Lupi, beyond which it loses itself in a narrow and faint streamlet. The main stream passes on, increasing in breadth to γ Normæ, where it makes an abrupt elbow, and again subdivides into one principal and continuous stream of very irregular breadth and brightness on the following side, and a complicated system of interlaced streaks and masses on the preceding, which covers the tail of Scorpio,

and terminates in a vast and faint effusion over the whole extensive region occupied by the preceding leg of Ophiuchus, extending Northwards to a parallel of 13° of South Declination, beyond which it cannot be traced, a wide interval of 14°, free from all appearance of nebulous light, separating it from the great branch on the North side of the equinoctial, of which it is usually represented as a continuation.

Returning to the point of separation of this great branch from the main stream, let us now pursue the course of the latter. Making an abrupt bend to the following side, it passes over the stars ι Aræ, θ and ι Scorpii, and γ Telescopii to γ Sagittarii, when it suddenly collects into a vivid oval mass about 6° in length and 4° in breadth, so excessively rich in stars that a very moderate calculation makes their number exceed 100,000. Northward of this mass this stream crosses the ecliptic in longitude about 276°, and proceeding along the bow of Sagittarius into Antinoüs, has its course rippled by 3 deep concavities, separated from each other by remarkable protuberances, of which the larger and brighter (situated between Flamsteed's stars 3 and 6 Aquilæ) forms the most conspicuous patch in the southern portion of the Milky Way visible in our latitudes.

Crossing the equinoctial at the 19th hour of Right Ascension, it next runs in an irregular, patchy, and winding stream through Aquila, Sagitta, and Vulpecula, up to Cygnus; at ϵ of which constellation its continuity is interrupted, and a very confused and irregular region commences, marked by a broad dark vacuity, not unlike the Southern "Coal Sack," occupying the space between ϵ , a, and γ Cygni, which serves as a kind of centre for the divergence of 3 great streams: one which I have already traced; a 2nd, the continuation of the 1st (across the interval) from a Cygni Northward, between Lacerta and the head of Cepheus to the point in Cassiopeia whence we set out; and a 3rd branching off from γ Cygni, very vivid and conspicuous, running off in a Southern direction through β Cygni and s Aquilæ, almost to the equinoctial, when it loses itself in a region thinly sprinkled with stars, where in some maps the

modern constellation Taurus Poniatowskii is placed. This is the branch which, if continued across the equinoctial, might be supposed to unite with the great Southern effusion in Ophiuchus, already noticed. A considerable offset, or protuberant appendage, is also thrown off by the Northern stream from the head of Cepheus directly towards the Pole, occupying the greater part of the quartile formed by α , β , ι , and δ of that constellation.

It is impossible to give any idea of the enormous number of stars in the Milky Way, but Sir W. Herschel recorded some facts that will assist us. That observer stated that on one occasion he estimated that 116,000 stars passed through the field of his telescope in ¼ hour c; and again that on Aug. 22, 1792, he saw 258,000 stars pass in 41^m. The surprising character of this result will be more adequately appreciated when compared with the number of stars that are visible to the naked eye. The common estimation gives between 3000 and 4000, though Struve augments the number to 6000 for persons of very acute vision c.

Sir John Herschel computed that the total number of stars visible in an 18-inch reflector cannot be less than 5\frac{1}{4} millions, and may probably be many more f. Struve's estimate for Sir W. Herschel's 20-ft. reflector is 20\frac{1}{2} millions.

A brief reference must here be made to what is commonly known as Sir W. Herschel's theory of the Milky Way. He conjectured that the stars were not indifferently scattered through the heavens, but were rather arranged in a certain definite stratum, comprised between 2 plane surfaces parallel to and near each other but prolonged to immense distances in every direction, the thickness of which stratum, as compared with its length and breadth, was inconsiderable; and that the Sun occupies a place somewhere about the middle of its thickness, and near the point where it subdivides into 2 principal streams,

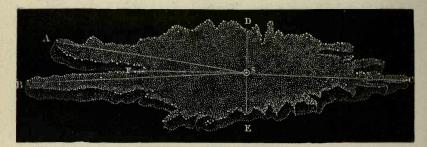
c Phil. Trans., vol. lxxv. p. 244. 1785.

d Ibid., vol. lxxxv. p. 70. 1795.
Etudes d'Astronomie Stellaire, p. 61.

^t Results of Astron. Obs., &c., p. 381. For more on this subject, see Outlines of Ast.

inclined to each other at a small angle. It is clear, then, that to an eye viewing the stratum from S, the apparent density of the stars would be least in the direction S D, or S E, and greatest in the direction S A, S B, S C, and this corresponds generally to the observed facts g. "Such is the view of the construction of the starry firmament taken by Sir William Herschelh, whose powerful telescopes first effected a complete analysis of this wonderful zone, and demonstrated the fact of its consisting entirely of stars i."

Fig. 80.



HERSCHEL'S STRATUM THEORY.

Though we talk of the "starry" heavens, and especially associate the Milky Way with the idea of stars, yet it must be remembered that there exist in the Milky Way certain places which seemingly are absolutely devoid of stars. When Sir John Herschel was preparing for his well-known expedition to the Cape of Good Hope in 1833, his aunt Caroline Herschel wrote and requested him to pay particular attention to the tail of the

man what his father's views were; but Proctor has pointed out with some force that there are grounds for the opinion that this "Stratum Theory" of Sir W. Herschel (which dates back to about 1784) was in part abandoned in after years by its author. It is not a little strange that if this be the case no one should have found it out for nearly \$\frac{2}{3}\$ths of a century. Proctor relies especially on a passage in Phil Trans., vol. ci. p. 269. 1811. (See Month. Not., vol. xxxiii. p. 541. Oct. 1873.)

g Hind, in Atlas of Astronomy.

h Thomas Wright, of Durham, first started this idea in 1734 (see his Original Theory or New Hypothesis of the Universe, London, 1751). An analysis by Prof. De Morgan of this curious work will be found in the Phil. Mag., 3rd ser., vol. xxxii. p. 241. April 1848.

¹ This paragraph is in substance taken from Sir John Herschel's Outlines of Ast., p. 569, a source of information selected for the obvious reason that Sir John ought to have known better than any

Scorpion, because Sir William Herschel had been much struck with the absence of stars there, and with the altogether abnormal disposition of the nebulous matter which exists there.

Sir John, writing to his aunt on June 6, 1834, replied that he had examined parts of the constellation Scorpio as requested, and that he had found many clusters of stars, and a nebula of remarkable shape. His aunt in thanking him said:—"It is not to clusters of stars that I was referring. One night your father, after a long and painful silence, cried out, Hier ist wahrhaftig ein Loch im Himmel, and after having dwelt a long time on it he left it not knowing what to make of it." On the strength of this statement Sir John Herschel seems to have returned to the subject, with the result that he found in the following positions patches of sky absolutely devoid of all stars:—

R	Á.	Dec	el.
h.	m.	0	,
16	15	-23	56
16	19	26	3
16	23	24	25
16	26	24	14
16	27	-24	0

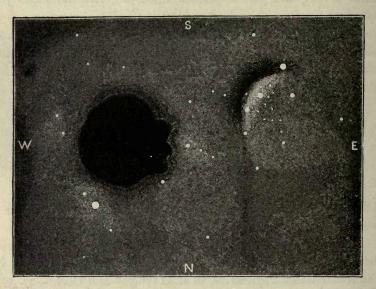
Ultimately it would seem that he found no fewer than 49 such void spaces.

Figure 81 represents a black void in the heavens observed and described by Trouvelot in August, 1876. It is situated in the constellation Sagittarius, in R.A. 17^h 56^m and Decl. -27° 51'. This black hole is almost circular; on the north-west of it there are 4 stars, the brightest of which is orange-coloured. To the East of this hole there is another void space, in shape a narrow crescent, but this space is less black and less sharply defined than the former k .

By the Greeks the Milky Way was termed the Γαλαξίας or Κύκλος γαλακτικός, and by the Romans the Circulus lacteus or Orbis lacteus; from our ancestors it received the names of "Jacob's Ladder," the "Way to St. James's," "Watling Street," &c. The diversity of the ancient names was equalled only by the diversity

of opinions that prevailed as to what it was. Metrodorus considered it to be the original course of the Sun, but that it was abandoned by him after the bloody banquet of Thyestes; others, that it pointed out the place of Phaëthon's accident; whilst a 3rd class thought that it was caused by the ears of corn dropped by Isis in her flight from Typhon. Aristotle imagined it to be the result of gaseous exhalations from the Earth, which were





BLACK SPACE VOID OF STARS IN THE CONSTELLATION SAGITTARIUS.

set on fire in the sky. Theophrastus declared it to be the soldering together of two hemispheres; and finally, Diodorus conceived it to be a dense celestial fire, showing itself through the clefts of the starting and dividing semi-globes.

The speculations of Democritus 1 and Pythagoras were to the effect that the Galaxy was neither more nor less than a vast assemblage of stars. Ovid speaks of it as a high road "whose groundwork is of stars." Manilius uses similar language. In

an English version of Manilius^m his allusion to the Milky Way runs as follows:—

"Or is the spacious bend serenely bright
From little stars, which there their beams unite,
And make one solid and continued light?"

It is singular that Ptolemy has in none of his writings expressed any opinion on it. Our own ancestors supported the star theory.

In Milton we find mention of that-

"broad and ample road, Whose dust is gold, and pavement, stars."

m Astronomicon, lib. i. cap. xv.

CHAPTER VII.

THE CONSTELLATIONS.

List of those formed by Ptolemy.—Subsequent Additions.—Remarks by Herschel, &c.—Catalogue of the Constellations, with the position of, and Stars in, each.

THE constellations have already been referred to generally: in this chapter they will be set out more particularly.

Ptolemy enumerates 48 constellations: 21 northern, 12 zodiacal, and 15 southern, as follows:—

Northern.

	**	250	
T	7700	Minor	

- 2. Ursa Major.
- 3. Draco.
- 4. Cepheus.
- 5. Boötes, or Arctophylax.
- 6. Corona Borealis.
- 7. Hercules, Engonasin.
- 8. Lyra.
- 9. Cygnus, Gallina.
- 10. Cassiopeia.
- 11. Perseus.
- 12. Auriga.
- 13. Ophiuchus (Serpentarius).
- 14. Serpens.
- 15. Sagitta.
- 16. Aquila, Vultur volans.
- 17. Delphinus.
- 18. Equuleus.
- 19. Pegasus, Equus.
- 20. Andromeda.
- 21. Triangulum.

The Little Bear.

- The Great Bear.
- The Dragon.

The Bear Keeper.

- The Northern Crown.
- Hercules kneeling.
- The Harp.
 - The Swan.
 - The Lady in her Chair.

The Charioteer.

- The Serpent Bearer.
- The Serpent.
- The Arrow.
- The Eagle.
- The Dolphin.
- The Little Horse.
- The Winged Horse.
- The Chained Lady.
- The Triangle.

Zodiacal.

- I. Aries.
- 2. Taurus.
- 3. Gemini.

- The Ram.
 - The Bull.
 - The Twins.

4. Cancer.

5. Leo.

6. Virgo.

7. Libra, Chelce.

8. Scorpio.

9. Sagittarius. 10. Capricornus.

11. Aquarius.

12. Pisces.

The Crab. The Lion.

The Virgin.

The Balance. The Claus [of Scorpio].

The Scorpion. The Archer.

The Goat.

The Water Bearer.

The Fishes.

Southern.

I. Cetus.

2. Orion.

3. Eridanus, Fluvius.

4. Lepus.

5. Canis Major. 6. Canis Minor.

7. Argo Navis.

8. Hydra. 9. Crater.

10. Corvus. II. Centaurus.

12. Lupus.

13. Ara. 14. Corona Australis. 15. Piscis Australis.

The Whale.

Eridanus, The River.

The Hare.

The Great Dog. The Little Dog.

The Ship "Argo."

The Snake. The Cup.

The Crow.

The Centaur. The Wolf.

The Altar. The Southern Crown. The Southern Fish.

Tycho Brahe (d. 1601) added—

I. Coma Berenices.

The Hair of Berenice.

2. Antinous.

(Both Northern Constellations.)

Bayer (circa 1603) added a—

I. Pavo.

2. Toucan.

3. Grus. 4. Phœnix.

5. Dorado, Xiphias.

6. Piscis Volans.

7. Hydrus. 8. Chamæleon.

9. Apis.

10. Avis Indica.

11. Triangulum Australe.

12. Indus.

The Peacock.

The American Goose.

· The Crane.

The Phœnix.

The Sword Fish.

The Flying Fish. The Water Snake.

The Chameleon.

The Bee.

The Bird of Paradise.

The Southern Triangle.

The Indian.

(All Southern.)

a Perhaps it would be more correct to say that Bayer "adopted" rather than "added," which might seem to imply

original design on his part. With this, Lynn asserts, he must not be credited. (Observatory, vol. ix. p. 255, July 1886.)

Royer, in 1679, added b-

I. Columba Noachi. The Dove of Noah. 2. Crux Australis. The Southern Cross. The Great Cloud. 3. Nubes Major. The Little Cloud. 4. Nubes Minor. 5. Lilium. Fleur-de-Lys. The Lily.

(All Southern Constellations.)

Halley, about the same period, added—

1. Robur Caroli. Charles's Oak. (A Southern Constellation.)

Flamsteed's maps also contain—

I. Mons Mænalus. The Mountain Mænalus. 2. Cor Caroli. Charles's Heart.

(Both Northern Constellations.)

Hevelius, in 1690, added—

. I. Camelopardus. The Cameleopard. 2. Canes Venatici, Asterion et Chara. The Hunting Dogs. The Fox and the Goose. 3. Vulpecula et Anser. 4. Lacerta. The Lizard. The Little Lion. 5. Leo Minor. 6. Lynx. The Lynx. The Shield of Sobieski. 7. Scutum, or Clypeus, Sobieskii. 8. Triangulum Minor. The Little Triangle.

9. Cerberus.

(All Northern: and) The Unicorn.

10. Monoceros. The Sextant of Urania. 11. Sextans Uraniæ.

(Southern Constellations.)

La Caille, in 1752, added—

I. Apparatus Sculptoris. The Apparatus of the Sculptor. 2. Fornax Chemica. The Chemical Furnace. The Clock. 3. Horologium. 4. Reticulus Rhomboidalis. The Rhomboidal Net. 5. Cæla Sculptoris. The Sculptor's Tools. Equuleus Pictoris. The Painter's Easel. 7. Pyxis Nautica. The Mariner's Compass. 8. Antlia Pneumatica. The Air Pump. o. Octans. The Octant. 10. Circinus. The Compasses.

11. Norma, alias Quadra Euclidis. The Rule, alias Euclid's Square. 12. Telescopium. The Telescope.

The Microscope. 13. Microscopium. The Table Mountain. 14. Mons Mensæ.

(All Southern Constellations.)

b Lynn has challenged the accuracy of this statement, asserting that the first 4 of these constellations were simply borrowed by Royer. (Observatory, vol. ix. p. 313, Sept. 1886.)

Le Monnier, in 1776, added-

I. Tarandus.

The Rein Deer.

2. Solitarius.

The Solitaire.

(The former in the Northern, the latter in the Southern hemisphere.)

In the same year Lalande placed Messier's name in the heavens, by forming a constellation in his honour, near Tarandus.

Poczobut, in 1777, added—

Taurus Poniatowskii.

The Bull of Poniatowski.

(Between Aquila and Ophiuchus.)

Hell formed in Eridanus-

Psalterium Georgianum.

George's Lute.

And, finally, in Bode's maps we meet with-

I. Honores Frederici.

The Honours of Frederick.

2. Sceptrum Brandenburgicum.

The Sceptre of Brandenburg.

3. Telescopium Herschelii.

Herschel's Telescope.

4. Globus Aërostaticus.

The Balloon.

5. Quadrans Muralis.

The Mural Quadrant.

6. Lochium Funis.

The Log Line.
The Electrical Machine.

7. Machina Electrica.

The Printing Press.

Officina Typographica.
 Felis.

The Cat.

Making in all 109 constellations. This number by no means exhausts the list of those which have been proposed by different persons. A writer in the *English Cyclopædia* very pertinently remarks: "In fact, half-a-century ago, no astronomer seemed comfortable in his position till he had ornamented some little cluster of stars of his own picking with a name of his own making."

Sir J. Herschel said: "The constellations seem to have been almost purposely named and delineated to cause as much confusion and inconvenience as possible. Innumerable snakes twine through long and contorted areas of the heavens, where no memory can follow them; bears, lions, and fishes, small and large, northern and southern, confuse all nomenclature," &c.

Many of the above smaller constellations are very properly rejected by modern uranographers, and in the list which follows

There appear to be 2 Musca's: one tion for Bayer's Apis; and the other so named by La Caille by way of substitu-

in the next chapter only those asterisms will be found which are generally acknowledged in the present day, and even some of these were rejected by Argelander d.

Argelander has given the following numbers as representing the stars of the magnitudes stated:—

$$1^{st}$$
 mag. = 20 | 4^{th} mag. = 425 | 7^{th} mag. = 13,000 | 2^{td} ,, = 65 | 5^{th} ,, = 1100 | 8^{th} ,, = 40,000 | 3^{rd} ,, = 190 | 6^{th} ,, = 3200 | 9^{th} ,, = 142,000

Grant's figures for the first 6 magnitudes are:-

According to Argelander the number of stars visible to the naked eye at Berlin is 3256. The number, of course, increases as we approach the equator, owing to the wider expanse of heavens opened up by the diurnal movement.

C. Von Littrow^e for the Northern hemisphere has made an enumeration as follows:—

originals which he condemned.

o Ast. Nach., vol. lxxiii. No. 1741.
Feb. 20, 1869.

d Proctor attempted a Reform of the Constellations on his own account, but his proposed modifications of existing names were far more barbarous than the

CHAPTER VIII.

A USEFUL CATALOGUE OF NAKED EYE STARS.

THE information which now follows respecting the constellations is designed to serve but a single purpose; to facilitate their study and the identification of their stars by the naked eye. Materials for the guidance of observers working with the telescope must be sought in Chapters X to XIII (post).

The French and German names of the constellations are given because they will often be useful to readers consulting books in those languages, and those names are not always to be found correctly rendered in common Dictionaries.

The term "meridional centre of constellation" may be thus explained. Project a line through the given R.A., and another through the given Declination, and their point of intersection will fall on a central part of the constellation, a celestial globe or map being employed.

It frequently happens in dealing with astronomical matters of various kinds that it is necessary to mention particular stars either by their names or by the letters or numbers commonly employed to indicate them. The reader or the listener whose attention is thus called to a particular star will often find it difficult on the spur of the moment to hunt it up in a catalogue, or in works such as Smyth's Cycle. Accordingly he will often find it convenient to have at hand a catalogue of the principal stars arranged, not in the true scientific order of Right Ascension, but gathered together in groups according to their constellations. Hence the raison d'être of the present catalogue in the form given to it.

It is intended to exhibit all stars whatsoever down to the 5th magnitude, with a certain number of the more important of

those which are usually ranked as being between the 5th and the 6th magnitudes.

It fortunately happens that astronomers have now at command 2 or 3 very important works reducing into shape and order the question of star magnitudes in a way which has never before been attained. I am alluding more especially to Pickering's Harvard Photometry and Pritchard's Uranometria Nova Oxoniensis as regards the Northern hemisphere; and to Gould's Uranometria Argentina as regards the Southern hemisphere.

The 2 former works have already been mentioned as regards the principles upon which they are constructed a. It suffices for the purposes of the present chapter to be able to record the fact that they have been constructed on definite principles. This remark does not with perfect strictness apply to Dr. Gould's work, for that is based on the old-fashioned method of eye estimates and not on anything instrumental, which is a great misfortune, having regard to the scarcity of information respecting the stars of the Southern hemisphere. However, it is abundantly evident that very great care and trouble was expended on it, and the results, so far as eye estimates of star magnitudes are concerned, are worthy of a high degree of confidence. I wish that my praise of Dr. Gould's labours could extend beyond this, but that is impossible, for he has given to the world the results of the labours of himself and his staff in a form which combines the maximum of confusion with the minimum of convenience. It has already been pointed out in these pages b that the astronomers of the last century left the constellations of the Southern hemisphere in a condition of much ambiguity and confusion. Attention was called to this fact by Sir John Herschel after his return from the Cape in 1837. He propounded c a scheme of reform which was deemed at the time far too radical to be reasonable or necessary. But F. Baily took advantage of his opportunities to do something; in point of fact he accomplished a very large measure of reform in his capacity of Editor of the Catalogues of Lacaille and of La Lande and of

a See p. 12, ante.

the compilation so widely known and appreciated as the British Association Catalogue. On these works Gould remarks in the following terms:—"The notation employed in these three works is essentially the same, and whatever may be thought of its merits, it has most assuredly tended to reduce the amount of discordance and to simplify the nomenclature, especially for the Southern stars. For, although it has been employed only to a very limited extent by the astronomers of other nations, a very large proportion of the practical astronomers in the Southern hemisphere has been supplied by England 4."

It is passing strange that the man who could have written the foregoing remarks should have sought to perpetrate the extravagant changes in the settlement accepted by all his predecessors which Gould has done. The result is a series of anomalies and monstrosities in the boundaries of his Southern constellations and in the lettering of the stars therein wholly unparalleled in the annals of astronomy. The reader will not be surprised to hear that, holding these views, and hoping that Gould's mischievous innovations will not command the assent of astronomers generally, I have wholly disregarded them in this and the other Catalogues of this volume, in which nothing has been drawn from Cordoba sources except information applicable to the physical circumstances of particular stars examined by the Cordoba observers. This information, thus for the first time made accessible to the general reader in England, will no doubt be highly appreciated. Nor is it possible to praise too highly the value and importance of the Harvard results, albeit that the Harvard Catalogue is printed by no means in the most convenient form possible as regards the arrangement of the matter which appears in its pages.

Very much more convenient indeed is the form of the *Uranometria Oxoniensis*, but that work came into my hands too late for me to make as much use of it as I should have liked to have done.

I frequently found it a matter of considerable difficulty to pick out the Cordoba stars which I wanted to identify, and no

d Introduction to the Uranometria Argentina, p. 59.

wonder, having regard to what has gone before. The difficulty of finding any particular star was only equalled by the difficulty of finding any particular constellation, as will be readily understood from the fact that Gould states the "order" in which the constellations are arranged "is such that, beginning with Octans, which includes the south pole, they follow the order of the polar distances of their southern limits, proceeding spirally around the celestial sphere in the direction of Right Ascensions."

The inconvenience of this will be best understood by a reader who wishes to consult the Argentine volume, and has only 2 hours at his disposal for hunting up a dozen stars.

It does not appear necessary to offer any detailed remarks with respect to the construction of the present Catalogue. Flamsteed's Catalogue and the B. A. C. are the basis of it generally, whilst the lettering depends, with scarce a single exception, on the authority of Baily. The stars chosen, the magnitudes were then attached to them from the *Harvard Photometry* when the stars were to be found therein: after that recourse was had to the *Uranometria Argentina*. It was then found that those two works together included virtually the whole of the stars required, with only one or two exceptions.

The places are more or less those of *Harvard* for the Northern hemisphere, and of Stone's *Cape Catalogue* for the Southern hemisphere.

The constellations in their names conform to the lists already given •

The selection of the stars here given has been made on the following principle. The Catalogue was (as stated above) intended to include all stars down to the 5th magnitude. To make sure of this I included all stars ranked by the Harvard observers down to 5·2, or by the Cordoba observers down to 5·5. All other Harvard stars between 5·3 and 5·5 inclusive, and all remaining Bayer's stars down to 5·9 if lettered with Greek letters, and all other Cordoba stars between 5·6 and 5·9 inclusive, have been put together by constellations in paragraph form by

[·] See p. 114 et seq., ante.

way of supplement to the Tables. But in a few cases, in order not to exclude stars which have long borne a Greek letter as their designation, the 5.9 limit has been disregarded, and accordingly a few stars marked as 6.0 or something less will be found here and there.

The various lists taken together should, if my work has been properly performed, embrace every star in the heavens down to the magnitude of 5.5; but owing to the extreme difficulty experienced in collating the Cordoba lists (for the reasons already given), I am not fully confident that the record is absolutely complete.

In the column headed "Magnitude," when there is only one entry its source will be indicated by the entry in col. 5; that is to say, a group of figures only in the 5th column are Harvard figures; but a group of figures with A prefixed are Cordoba figures from the *Uranometria Argentina*. But if there is a second entry in the "Magnitude" column, or within the same parenthesis in the Supplementary Lists, it is from the *Uranometria Nova Oxoniensis*. The estimates in that work are given to 2 places of decimals, but in transcribing the results I have been content to take the nearest first decimal, in excess or defect, as the case might be.

Inasmuch as the magnitudes of a very large number (perhaps of two-thirds) of the stars here given are photometric, whilst the remainder depend only on eye-estimates, it seemed expedient to take some steps to indicate which were which. It has been already pointed out in a previous paragraph that the Cordoba estimates can in the Tables be immediately discriminated from the Harvard and Oxford photometric values by reason of the fact that a capital A is everywhere prefixed to the reference numbers of the Cordoba stars. The question then arose, how to indicate the diverse origins of the magnitudes of the stars in the supplementary lists prepared to complete the muster roll of each constellation up to mag. 5½ or thereabouts (which was the task I proposed to myself) without inconveniently multiplying symbols or marks in the printing.

I think the distinctions will be discoverable without difficulty

if the following facts are borne in mind. The Harvard Photometry extends from the N. Pole to Decl. - 30°, and also embraces occasionally a star which is a degree or two more to the S. The Uranometria Oxoniensis also extends from the N. Pole beyond the the Equator, but terminates very exactly at Decl.-10°. The Uranometria Argentina extends from the S. Pole beyond the Equator up to Decl. + 10°. It therefore overlaps Harvard to the extent of 40° and Oxford to the extent of 20°. But notwithstanding this overlap, I have made absolutely no use whatever of the Argentine figures except in their own proper territory (so to speak) of the Southern hemisphere through the 60° of Declination from -30° to -90° . Within those limits all the values of magnitude (excepting, as above mentioned, a few Harvard stars lying between -30° and -34°) are Argentine ones. It only remains then to be added that the position of a constellation, whether it be wholly N. or wholly S. of Decl. - 30°, determines the authorship of its star magnitudes. Constellations which are cut by the 30° line of Declination are of course of mixed origin as regards their star magnitudes. Where any particular star bears a Greek or a Roman letter of designation, the reader must exercise a little discrimination of his own in deciding whether the magnitude assigned in this chapter is photometric or estimated; but when it is a question of a numbered star, there need be no uncertainty, because I have adopted the following rule: No B. A. C. number is applied to a star whose magnitude is given estimated; no Lacaille or Brisbane number is given to a star whose magnitude is photometric. I think it will be found, on a full examination, that to this rule no exception has in any case been made.

As to certain of the stars, some annotations are desirable in order to reconcile or to point out doubts and uncertainties which exist; but to have worked up the available materials exhaustively would have required more time and more space than was at my command. Many such annotations will be found in the 3 works already so often cited—the Harvard Photometry, the Uranometria Oxoniensis, and the Uranometria Argentina—and the reader desirous of pursuing the matter in detail must consult those works.

1. ANDROMEDA.

Fr. Andromède; Germ. Andromeda.

			R.A. h. m.	Decl.
Meridional Cen	tre of Constellation		 0 40	+ 38
Approximate	Preceding	•••	 23 0	
Boundaries,	Following		 2 25	
1900.	North			+ 55
1900.	South			+ 20

Andromeda is one of the largest and most important constellations in the Northern hemisphere.

It comprises the following conspicuous stars:-

	Mag.	1		Mag.
a (Alpheratz)	 2.1	v	 	 3.7
β (Mirach)	 2.2	0	 	 3-8
γ (Almaac)	 2.2	μ	 	 3.9
δ	 3.4	1856		

It includes also 30 stars between mags. 4—5.2, and is rich in telescopic objects of interest and importance.

No.	Letter.	Flam- steed.	В.А.С.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.		nitude. : Oxford.
			Estate of	& FETT	h. m.	0 /	Te He	
1	0	1	8023	4073	22 56.4	+41 41	3.8	: 3.7
2		2	8028	4076	22 57.1	+42 7	5·1	: 5.3
3		3	8036	4079	22 58.8	+ 49 24	4'9	: 4'9
4		7	8082	4104	23 7.1	+ 48 45	4.7	: 4.9
5		8	8114	4120	23 12.2	+ 48 22	4'9	: 5.0
6	λ	16	8224	4174	23 31.7	+ 45 48	4.0	: 3.7
7		17	.8229	4176	23 32.3	+ 42 36	4.3	: 4'5
8	к	19	8237	4183	23 34'5	+ 43 40	4.4	: 4'3
9	Y	20	8261	4197	23 40'1	+ 45 45	5.0	: 5.0
10	a	21	4	5	0 2.3	+ 28 26	2.1	: 2.0
11		22	• 16	13	0 4.1	+ 45 24	4.9	: 5.0
12	0	24	52	40	0 10.8	+ 38 1	4.3	: 4'4
13	σ	25	58	42	0 12.0	+ 36 7	4.6	: 4'4
14	π	29	155	83	0 30.2	+33 4	4'4	: 4.2
15	•	30	164	90	0 32.2	+ 28 40	4.6	: 4'3

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
		00000			h. m.	0 ,	TRICK STATE
16	δ	31	166	92	0 32.9	+ 30 12	3.4 : 3.5
17	5	34	215	119	0 41.0	+ 23 37	4.4 : 4.1
18	ν	35	227	127	0 43.2	+40 26	4.4 : 4.6
19	μ	37	259	148	0 50.1	+ 37 51	3.9 : 4.0
20	η	38	264	150	0 50.8	+ 22 47	4.6 : 4.4
21	φ	42	330	182	1 2.2	+ 46 36	4.3 : 4.4
22	β	43	334	185	1 3.0	+ 34 59	5.5 : 5.5
23	€	46	404	214	1 15.3	+ 44 54	4.9 : 5.2
24	ω	48	432	228	1 20.5	+ 44 47	4.8 : 4.9
25	A	49	441	234	1 22.9	+ 46 23	5.3 : 2.4
26		50	480	248	1 29.7	+ 40 48	4.5 : 4.5
27	υ	51	487	251	1 30.6	+48 1	3.7 : 3.8
28	x	52	492	254	I 32.6	+ 43 46	5.1 : 2.5
29	τ	53	502	259	1 33.6	+ 39 58	4.9 : 5.0
30			510	261	1 34.2	+ 42 1	5.5 : 2.4
31		54	522	269	1 36.1	+ 50 5	4.5 : 4.3
32	γ	57	628	324	1 56.2	+41 45	2.2 : 2.I
33		58	649	334	2 1.3	+ 37 18	4.8 : 5.1
34			100	59	0 21.8	+ 43 44	5.5 : 2.4
35	b	60	676	349	2 5.8	+ 43 40	2.1 : 2.1
36	c	62	706	364	2 11'5	+ 46 49	5.2 : 5.4
37		65	735	381	2 17.7	+ 49 44	4.9 : 2.1

Fl. 11 (5·3); Fl. 14 (5·3); Fl. 15 (5·5); Fl. 18 (5·3); ρ (5·3); Fl. 28 (5·3); B.A.C. 152 (5.4); Fl. 36 (5.4); Fl. 41 (5.3); Fl. 47 (5.5); Fl. 64 (5.5).

2. ANTLIA PNEUMATICA.

Fr. La Machine Pneumatique; Germ. Die Luftpumpe.

THE REAL PROPERTY.	F-15 15 25 35 15		R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	10 0	-35
	Preceding	 	9 25	
Approximate Boundaries.	Following	 	11 20	
	North	 		- 25
1900.	South	 		-40

This is a small constellation destitute of conspicuous stars, the largest, a, being only of mag. 4.5. There are only 2 others which are brighter than mag. 5.2. It lies immediately to the N. of Argo, to which constellation its stars are sometimes regarded as belonging.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl, 1880.	Magnitude. Harv. or Arg. : Oxford.
9.0					h. m.	0 1	
1	E		3244	A 2	9 24'3	- 35 25	5.0
2	θ		3332	1746	9 38.9	- 27 13	4.9
3	a		3578	1842	10 21.7	- 30 27	4.2

 η (5.6); Lac. 4234 (5.8); Lac. 4278 (5.7); δ (6.0); Lac. 4358 (5.9); Lac. 4415 (5.9); Lac. 4483 (5.8); Lac. 4527 (5.1); Lac. 4580 (5.8).

3. APUS.

Fr. L'oiseau de Paradis; Germ. Der Paradiesvogel.

				R.	A.	Decl.
				h.	m.	0
Meridional Cen	tre of Constell	ation	 	15	30	-76
Aumorimata	Preceding	•••	 	13	0	
Approximate Boundaries,	Following		 	17	30	
	North		 			-70
1900.	South		 			-84

Apus is a small southern constellation with only one star (a) as bright as mag. 3.9, though it has 7 of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
			Haraga .		h. m.	0 /	
1	θ	****	4660	A 4	13 53.7	- 76 13	52
2	η		4692	A 6	14 3'3	-80 26	5.3
3	•		4712	A 9	14 8.1	-79 33	5.2
4	α		4833	A 14	14 33.0	— 78 32	4.0
5	δ		5339	A 40-I	16 2.5	- 78 23	4.6
8/2/8	B. The						
6	1 7		5439	A 44	16 15.0	— 78 38	3.9
7	β		5510	A 47	16 26.0	-77 16	4.2
8	5		5810	A 60	17 9.5	-67 39	5'4

 $\kappa^{1}(5.8); \kappa^{2}(5.9); \delta^{1}(5.2); \delta^{2}(5.5); \iota(5.8).$

4. AQUARIUS.

Fr. Le Verseau; Germ. Der Wassermann.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constell	ation	 	22 20	13
	/ Preceding		 	20 35	
Approximate	Following		 	23 50	
Boundaries,	North	🌘	 		+ I
1900.	South		 		-25

The two brightest stars, β and a, are only of mags. 3·1 and 3·2 respectively, but of stars between 4—5·2 mags. there are an unusual number (30), and many interesting telescopic objects. The principal stars are the following:—

		Mag.			Mag.
β	 	 3.1	. c2	 	 3.6
a	 	 3.2			
		3.4			

No.	Letter.	Flam- steed.	B,A,C,	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
				TACAL SE	h. m.	0 /	
1	€	2	7196	3647	20 41.3	- 9 56	3.8
2		3	7201	3649	20 41'4	- 5 28	4.6 : 4.8
3	μ	6	7239	3666	20 46.2	- 9 26	4.8 : 4.9
4	ν	13	7344	3723	3.1	- 11 51	4.6
5	β	22	7478	3795	21 25.2	- 6 6	3.1 : 3.1
6			a benin in			- 8 24	
8	E	23	7514	3811	21 31.4		4.8 : 4.7
7	0	31	7672	3889	21 57.1	- 2 44	4.7 : 4.6
8		32	7685	3896	21 58.6	— I 29	5.2 : 5.6
9	a	34	7688	3899	21 59.6	- 0 54	3.5 : 3.0
10	ı	33	7691	3901	22 0'0	— 14 27	4'3
				2 4 作			
11	θ	43	7773	3940	22 10.5	- 8 23	4'3 : 4'4
12	γ	48	7795	3950	22 15.5	— I 59	4.1 : 4.0
13	π	52	7814	3960	22 19.1	+ 0 46	4.6 : 4.8
14	5	55	7832	3970-1	22 22.7	- o 38	3.8 (4.7) 3.7
15	σ	57	7840	3978	22 24.2	- 11 18	4.8
					THE PROBLE		

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 /	WHITE STATE
16	υ	59	7864	3991	22 28.1	- 21 19	5.5
17	η	62	7868	3994	22 29.2	- 0 44	4.3 : 4.1
18	g	66	7922	4018	22 37'1	- 19 28	4.8
19	72	71	7954	4031	22 43'2	-14 14	4.1
20	λ	73	7970	4040	22 46.4	- 8 13	3.8 : 3.8
18 61	: 8	-6	ma 0 a		20 1915	-6 -0	
21	c ¹	76 86	7980	4047	22 48.3	— 16 28	3.4
22	c^2		8047	4083	23 0.5	- 24 23	4.8
23	c^3	88	8062	4093	23 3.1	-21 49	3.6
24	1 2 3	89	8069	4096	23 3.5	-23 6	4'9
25	φ	90	8085	4106	23 8.1	- 6 41	4.5 : 4.3
26	ψ1	91	8095	4109	23 9.6	- 9 44	4'5
27	X	92	8102	4113	23 10.7	- 8 22	5.3 : 2.2
28	¥2	93	8109	4119	23 11.7	- 9 50	4.2
29	¥3	95	8116	4124	23 12.7	- 10 16	5.1
30		94	8117	4125	23 12.8	- 14 7	5.3
	b ₁	-0	0		20 16-	20.47	417
31		98	8144	4139	23 16.7	- 20 45	4·I
32	b ²	99	8161	4145	23 19.7	- 21 18	4.4
33	b4	101	8202	4157	23 27.0	- 2I 34	4.7
34	ω1	102	8232	4178	23 33.6	- 14 53	5.5
35	A ²	104	8242	4187	23 35.5	- 18 29	4.8
36	ω^2	105	8246	4190	23 36.5	-15 12	4.7

Fl. 1 (5·4); Fl. 5 (5·5); Fl. 18 (5·4); d (5·4); e (5·4); Fl. 41 (5·5); ρ (5·4); Fl. 47 (5·4); k (5·5); Fl. 38 (5·5); Fl. 68 (5·5); k (5·4); Fl. 97 (5·3); H.P. 4189 (5·5); i^1 (5·3); i^2 (5·4); Fl. 108 (5·3).

5. AQUILA, [with ANTINOUS].

Fr. L'Aigle; Germ. Der Adler mit dem Antinous.

			R.A.	Decl.
			h. m.	
Meridional Cen	 19 30	+ 2		
N. Paris . S. Carlo	/ Preceding		 18 40	
Approximate	Following		 20 25	,
Boundaries,	North			+16
1900.	South			-12

Aquila is but a small constellation; it is, however, rich in large stars and double stars. The conspicuous stars are:—

	Mag.	The second second		Mag.
a (Altair)	 1.0	δ	 	3.5
γ	 2.8	λ	 	3.6
\$		η	 	3.9
θ	 3.4			

There are 21 stars of mags. 4-5.2.

			Section 1	1			
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
	The same				h. m.	0 ,	
I		4	6379	3158	18 32.8	+ 1 56	5.1 : 2.0
2				3227	18 52.9	+ 17 12	5.2 : 5.0
3		11	6483	3229	18 53.6	+ 13 28	5.5 : 2.5
4	€	13	6487	3231	18 54.2	+ 14 54	4.1 : 3.8
5		12	6492	3240	18 55.3	— 5 54	4.0 : 4.0
6	5	17	6528	3259	18 59.9	+ 13 41	3.1 : 3.1
7	λ	16	6526	3260	18 59.9	- 5 4	3.6 : 3.3
8		18	6543	3264	19 1.3	+ 10 53	5.1 : 2.0
9		21	6572	3284	19 7.7	+ 2 5	5.2 : 5.2
10	ω	25	6595	3305	19 12.2	+ 11 23	5.1 : 2.3
11	f	26	6614	3315	19 14.1	— 5 38	5.5 : 2.5
12	δ	30	6646	3343	19 19.4	+ 2 53	3'5 : 3'4
13	ν	32	6653	3349	19 20.4	+ 0 6	4.8 : 5.1
14	e	36	6679	3360	19 24'4	- 3 2	5.5 : 2.5
15	μ	38	6701	3368	19 28.2	+ 7 8	4.7 : 5.1
16	K	39	6713	3380	19 30.4	- 7 18	4.9 : 5.0
17	1	41	6715	3381	19 30.2	— I 33	4.3 : 4.2
18	σ	44	6729	3394	19 33.3	+ 5 8	5.0 : 4.9
19	1 7	50	6772	3418	19 40.6	+10 19	2.8 : 2.8
20	a	53	6802	3429	19 44'9	+ 8 33	1.0 : 1.0
2.			6905	2.122	70 150	1	
21	0	54	6805	3432	19 45.3	+ 10 7	5.5 : 2.1
22	η	55	6811	3436	19 46.4	+ 0 42	3.9 : 4.5
23	\$	59	6825	3444	19 48.5	+ 8 9	4.9 : 4.9
24	β	60	6833	3450	19 49.4	+ 6 6	4.0 : 3.7
25	θ	65	6934	3514	20 5.1	- 1 11	3.4 : 3.3

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. Oxford.
26 27 28	ρ 	67 69 71	6952 7058 7122	3523 3580 3608	h. m. 20 8.7 20 23.4 20 32.1	0 , +14 50 - 3 17 - 1 31	5.1 : 5.1 5.2 : 5.2 4.4 : 4.6

g (5·5); Fl. 19 (5·3); Fl. 20 (5·3); H.P. 3293 (5·5); Fl. 22 (5·4); H.P. 3298 (5·4); Fl. 23 (5·4); A (5·4); b (5·3); Fl. 37 (5·3); Fl. 45 (5·5); χ (5·4); v (5·8); π (5·7); Fl. 57 (5·3); ϕ (5·4); τ (5·6); B.A.C. 7014 (5·4); Fl. 70 (5·3).

6. ARA.

Fr. L'Autel; Germ. Der Altar.

			R.A.	Decl.
35 131 10	The state of the s		h. m.	0
Meridional Cen	tre of Constellation	 	16 50	-55
Approximate Boundaries,	Preceding	 	16 10	
	Following	 	18 .0	
1900.	North	 •••		-46
1900.	South	 		-66

Ara is a constellation small in size, but nevertheless possessed of a number of important stars. The chief of these are:—

		Mag.			Mag.
β	100	 2.8	δ	 	
a			η	 	 3.8
\$		 3-2	θ	 	 3.9
γ		 3.6			

Of stars between $4-5\frac{1}{2}$ mags, there is but 1, a remarkable disproportion.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
	7.76				h. m.	0 ,	
1	η		5609	A 13	16 39.4	- 58 49	3.8
2	5		5683	A 23	16 48.7.	- 55 48	3.5
3	ϵ^1		5697	A 25	16 50.0	-52 59	4.5
4	γ		5850	A 50	17 15.3	- 56 16	3.6
5	β		5852	A 51	17 15.3	— 55 ² 5	2.8

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 /	
6	δ		5877	A 60	17 20.3	— 60 35	3.7
7	a		5899	A 62	17 22.6	-49 47	2.9
8	θ		6105	A 84	17 57.3	- 50 6	3'9

Lac. 6824 (5.8); Lac. 6912 (5.6); ϵ^2 (5.9); ι (5.8); κ^1 (5.8); σ (5.5); π (5.8); λ (5.6); μ (5.7).

7. ARGO.

Fr. Le Navire Argo; Germ. Das Schiff Argo.

				R.A.	Decl.				
				h. m.	0				
Meridional Cent	Meridional Centre of Constellation								
Approximate	Preceding			6 20					
	Following			11 0					
Boundaries,	North				- 9				
1900.	South				-70				

The constellation Argo in consequence of its great size has been by common consent divided into four divisions, respectively called Carina, Malus, Puppis and Vela, to which some add a fifth, Pyxis Nautica, a part of Malus. But for star-gazing purposes it is preferable to regard the constellation as one whole. The conspicuous stars are:—

				Mag.	1			Mag.
a	(Cano	pus)		0.4	ρ			 2.9
β				2.0	γ			 3.0
€				2.1	τ			 3.2
δ				2.2	υ			 3.3
ı	•••	•••		2.5	E			 3.4
5		•••	•••	2.5	ν			 3.5
λ	•••			2.5	σ		•••	 3.5
к	•••			2.7	ω			 3.6
π	•••	•••		2.7	X	•••	•••	 3.7
θ	•••		•••	2.9	Ψ	•••		 3.7
μ	•••		•••	2.9	φ		•••	 3.9

These will be found scattered all over the constellation. The first-named, Canopus, is the second brightest star in the heavens,

being but slightly inferior to Sirius, which it precedes by only 18^m in R.A. The Milky Way runs through the main part of Argo.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
100			- NOA		h. m.	0,	
I	a		2096	A 7C.	6 21.3	- 52 38	0.4
2	ν		2188	A 20 P.	6 34.1	-43 4	3.2
3	T		2256	A 39 P.	6 47.0	- 50 28	3.5
4	π		2414	A 82 P.	7 12.9	-3653	2.4
5	σ		2482	A 99P.	7 25.4	-43 4	3.2
,			-6		7 44.2	- 24 34	3'4
6	\$	7	2602	1474 A 65 C.	7 44'3	-24 34 $-52 39$	3.7
7	X	":	2665	A 65 C. A 248 P.	7 53.7 7 59.4	- 32 39 - 39 40	2.2
8	5		2710	1515	8 2.4	- 23 58	2.0
9	ρ	15	2728	A 9V.	8 5.8	- 46 59	3.0
10	γ		2755	A 91.	0 50	. 40 39	
11	•		2833	A 89C.	8 20.1	- 59 7	2.1
12	0		2950	A 56V.	8 36.9	- 52 29	4.0
13	δ		2979	A 65 V.	8 41.4	- 54 16	5.5
14	λ		3126	A 100 V.	9 3.6	- 4 ² 57	2.2
15	β		3177	A 123C.	9 11.9	- 69 14	2.0
						-0 .6	2.5
16	ı		3186	A 127 C.	9 13.9	- 58 46	2.2
17	к		3213	A 129 V.	9 18.4	- 54 30	3.7
18	4		3257	A 140 V.	9 26.0	- 39 57 64 31	
19	υ		3365	A 160 C.	9 44'1	-64 31	3.3
20	φ		3410	A 171 V.	9 52.7	- 54 °	39
21	ω		3516	A 185 C.	10 10.9	-69 26	3.6
22	0		3686	A 223C.	10 38.7	-63 46	2.9
23	η		3695	A 231 C.	10 40.4	-59 3	Var.
24	μ		3702	A 229 V.	10 41.6	- 48 47	2.0
1 -			0		JURY EL SU	F S S S S S S S S S S S S S S S S S S S	

(i.) Carina.

			R.	A.	Decl.
			h.	m.	0
Meridional Cent	 8	40	-62		
	/ Preceding	 	 6	20	
Approximate	Following	 	 II	0	
Boundaries,	North	 			-53
1900.	South	 			-70

The bright stars appropriated to Carina are:—

		Mag.			Mag.
q	 	 3.3	 a	 	 3.8
p	 	 3.6	l	 	 34 var.

There are 30 stars between $4-5\frac{1}{2}$ mags.

No.	Letter.	Flam- steed.	B,A,C.	Harvard or Argent. Reference.	R. A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
177				dia avid	h. m.	0 /	
I			2176	A 11	6 32.3	- 5 ² 5 ²	4.8
2	В		2259	A 18	6 47'2	- 53 29	4.8
3	Q		2524	A 50.	7 32.7	- 52 16	5.2
4			2694	A 73	7 57'5	- 60 15	5.2
5	Dı		2713	A 77	7 58.8	-63 14	5.3
1	-						
6	B ²		2770	A 82	8 7.0	-60 56	5.3
7	e		2921	A 96	8 32.5	— 57 35	5.4
8	d		2962	A 99	8 38.0	- 59 19	4.7
9	f		2998	A 103	8 43.6	- 56 19	2.1
10	C		3064	A 108	8 52.3	- 60 11	4.0
	b1				0	-0.6	
11			3073	A 109	8 54.0	- 58 46	5'4
12	E		3134	A 115	9 4.6	-70 3	5.5
13	G	•••	3136	A 116	9 4.8	—72 8	4.8
14	a		3149	A 117	9 7.8	-59 29	3.8
15	i		3152	A 119	9 8.6	- 61 50	4.3
16	g		3179	A 125	9 12.8	-57 2	4.2
17	k		3212	A 132	9 18.0	-57 2 -61 53	5.5
18	h		3289	A 147	311 331	- 58 42	
1000	m		Marie .		9 29.0	The second second second	4.9
19	1		3320	A 150	9 36.0	- 60 47	5.1
20	1		3353	A 157	9 41.9	-61 57	3 ³ Var.

No.	Letter.	Flam- steed.	В. А. С.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg.: Oxford,
				-012 Ville 1	h. m.	0 ,	THE LABORATOR
21	q		3526	A 187	10 13.1	- 60 44	3.3
22	L	• •••	3564	A 191	10 19.4	-66 17	5°4
23	I		3585	A 193	10 22.0	-73 25	4.3
24	8		3594	A 196	10 23.5	- 58 8	4.6
25	K		3617	A 202	10 27.3	—71 22	5.0
26	p		3619	A 203	10 27.8	-61 4	3.6
27	r		3635	A 208	10 30.0	- 56 56	5.3
28	t1		3642	A 210	10 31.8	- 58 56	5'5
29	t^2		3655	A 213	10 34.2	- 58 34	5.5
30			3688	A 224	10 39.0	- 59 56	5.5
31	u		3740	A 246	10 48.6	- 58 13	4.1
32	z^1		3805	A 257	11 1.6	-61 46	5.3
33	x		3818	A 260	11 3.2	- 58 19	4.6
34	y		3835	A 263	11 7.5	- 59 39	5*2

Lac. 2601 (5.8); Lac. 2642 (5.7); Lac. 2783 (5.9); Lac. 2829 (5.7); Lac. 3046 (5.9); Lac. 3275 (5.7); b² (5.7); Lac. 3846 (5.7); H (5.9); 2871 Brisb. (5.7); M (5.7); Lac. 4367 (5.6); Lac. 4375 (5.7); Lac. 4440 (5.7); Lac. 4455 (5.6); Lac. 4475 (5.8); Lac. 4657 (5.7).

(ii.) Malus, with Pyxis Nautica.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of sub-division	 	9 0	-30
	Preceding	 	8 20	
Approximate	Following	 	9 20	
Boundaries,	North	 		-21
1900.	South	 		-38

Some of the stars usually allotted to Malus were by Lacaille formed into a small sub-constellation by themselves and designated Pyxis Nautica, the Mariner's Compass, but this has not been so generally accepted as all Lacaille's other designations. The only bright star appropriated to Malus is a of mag. 3.6. There are 9 stars between $4-5\frac{1}{2}$ mags.

Ne	o. Let	ter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
		12	11 6		如何	h. m.	0 ,	
	1 !	,		2916	1590	8 32.7	- 25 50	5.0
	2 .		•••		1593	8 33.9	- 22 16	5.1
1	3 1			2932	1595	8 34.7	- 29 8	4.9
1 4	4	5		2935	A22 Pyx.	8 35.4	- 34 53	4.4
	5	ı		2964	1604	8 39.5	- 32 45	3.6
	6	9		3010	1621	8 45.4	- 27 16	4.3
	7	l		3051	1633	8 50.4	- 27 13	4.8
1	8 .			3121	1663	9 2.8	- 25 22	4.8
1	9	h		3195	1690	9 16.2	- 25 27	4.9
10	0 .			3207	1693	9 18.0	- 28 19	4.9

B.A.C. 2868 (5.4); Lac. 3549 (5.8); B.A.C. 3130 (5.4).

	(iii	.) Pu	ippis.		
				R.A.	Decl.
				h. m.	0
Meridional Cent	tre of sub-divis	sion		 7 40	-32
	/ Preceding			 6 20	
Approximate	Following			 8 20	
Boundaries,	North				-11
1900.	South				-50

The only bright star appropriated to Puppis is c of mag. 3.6. There are 52 stars between 4-5½ mags.

1	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv- or Arg.: Oxford.
			1		E 8 = 11 =	h. m.	0 ,	
	1			1933	A 66 Col.	5 55'5	- 42 49	4.0
	2	Z		2137	A 16	6 26.8	-50 9	5.2
	3	V		2193	A 21	6 35.5	-48 6	5.3
	4	x		2231	A 31	6 43.3	-37 48	5.3
	5	X			A 38	6 46.5	- 46 29	5.4
	6			2289	A 47	6 53.0	- 48 33	5.2
	7	t		2295	A 49	6 54.0	- 33 57	5'4
	8	C	•••	2327	A 59	7 0.3	- 42 10	5.2
	9	H	•••	2332	A 61	7 0.8	-49 24	5.3
	10	A		2355	A 67	7 4.8	- 39 28	5'3

			No.			,	
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 ,	
11	I		2389	A 71	7 9.1	-46 34	4.8
12	Li	•••	2392	A 72	7 9.7	-44 50	5.3
13			2404	A 78	7 11.3	-48 3	5.0
14			2422	A 83	7 14.0	- 36 30	5.3
15	3.3		2425	A 84	7 14'4	- 36 31	5'4
	1			7.76	7 248	- 22 46	4.8
16		•••		1416	7 24.8		4.8
17		•••	2484	1420	7 26.0	- 30 43 - 14 16	
18		•••		1429	7 28.3	- 14 16 - 22 2	5.0
19			•••	1431	7 29.0	- 22 2 - 12 T2	4.5
20	n1	•••	2497	1432	7 29.3	- 23 13	5.5
21	p		2508	1433	7 30.6	- 28 6	4.4
22	f		2523	A 127	7 32.9	- 34 42	4.8
23	m		2525	1443	7 33'3	- 25. 6	4'3
24	k!		2530	1445	7 33'9	- 26 32	4.6
25	k^2	1	2531	1446	7 33.9	- 26 32	4.6
26			2538	1447	7 34'9	-14 59	5.5
la large	d1			A 143	7 35.2	- 38 T	5.4
27		I	²⁵⁴³ ₂₅₆₀	1461	7 38.7	- 28 7	5.0
28		1	2562	1462	7 39.0	- 28 40	4.5
29		3		1469	7 40.4	- 14 16	5.2
30		4	2573	1409	1 40 4		
31	c		2580	A 175	7 41.0	-37 41	3.6
32	0		2594	1472	7 43'1	- 25 38	4.7
33	Q		2611	A 196	7 44.8	- 46 46	5.1
34	P		2620	A 199	7 45.6	-46 4	4.3
35		9	2622	1482	7 46.2	- 13 35	5.2
	178		-60	A are	7 48.1	-40 16	4.0
36	a ,		2634	A 213	7 48.4	- 38 33	4'9
37	b	•••	2635	A 214	7 49 7	-49 18	5.0
38		•••	2642	A 216		-47 47	4.5
39	R	•••	2644	A 218	7 49.8	- 22 33	4.3
40		II	2652	1492	7 51.7	22 33	
41			2655	1496	7 52.9	- 30 I	4.8
42		12	2662	1500	7 53'9	-22 59	5.3
43			2666	1501	7 54'5	- 18 4	4.6
	H THEODY			Depart a	No to the William		

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
SU TO	6 5 1 5				h. m.	0 /	
44				A 233	7 54.8	-48 55	5.0
45			2723	1514	8 2.0	- 20 12	5.0
							REINSTALL.
46		16	2736	1518	8 3.7	— 18 54	4.3
47		19	2750	1524	8 5.6	-12 34	4.6
48	h^1		2762	A 267	8 7.0	- 39 15	4.8
49		20	2769	1529	8 7.8	- 15 26	5.1
50	r		2774	A 274	8 8.0	- 35 42	5.3
						(and the last	
51			2777	A 276-7	8 9.5	- 35 58.0	5*4
52	h^2		2780	A 279	8 9.8	-3959.	4.8
53	q	•••	2795	A 289	8 14.1	- 36 16	4.7

Lac. 3163 (5·7); Lac. 2137 (5·8); G (5·9); Lac. 2608 (5·8); Lac. 2673 (5·6); E (5·7); Lac. 2714 (5·6); F (5·8); s (5·4, H.P. 1396); Lac. 2773 (5·8); Lac. 2793 (5·6); H.P. 1410 (5·4); y (5·9); B.A.C. 2565 (5·4); W (5·7); Lac. 2950 (5·6); Lac. 2945 (5·7); Fl. 5 (5·4); Lac. 2991 (5·9); Lac. 3003 (5·9); Lac. 3035 (5·7); N (5·7); O (5·6); Lac. 3103 (5·9); Lac. 3131 (5·8); Lac. 3197 (5·3); H.P. 1542 (5·4); w (5·7); H.P. 1555 (5·5); B.A.C. 2827 (5·5).

	(iv	7.) V	ela.		R.A.	Decl.
					h. m.	0
Meridional Cen	tre of sub-divi	sion			9 30	-45
	/ Preceding				8 0	
Approximate Boundaries,	Following				11 0	
	North			8		-38
1900.	South					-57

The only bright star appropriated to Vela is N, of mag. 3.2. There are 27 stars between $4-5\frac{1}{2}$ mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880,	Magnitude. Harv. : Oxford,
193168			STREET, STREET	E. RETAIL FOR	h. m.	0 ,	
1			2642	A 216 P.	7 49 7	-49 18	5.0
2			2670	A 233 P.	7 54.8	-48 55	5.0
3	В		2823	A 26	8 18.8	-48 6	5.4
4			2866	A 34	8 25.4	-44 19	5.2
5	e		2926	A 48	8 33'4	- 42 34	4.6

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford,
			1205	1911	h. m.	0,	
6	6		2947	A 53	8 36.7	-46 13	4.1
7			2955	A 58	8 37.3	- 46 53	5*2
8	$\mid d \mid$		2973	A 64	8 40.1	-42 13	4.4
9	a		2981	A 66	8 42.0	-45 36	4.1
10	H		3066	A 88	8 52.7	- 52 15	5'4
11			3081		0		
12			- 12 Control 2 1 1 2 5	A 91	8 55.6	-40 47	5.5
13			3110	A 97	9 0.0	-46 37	4.6
1000	k2		3163	A 115	9 10.9	- 38 4	5.2
14	N	•••	3165	A 117	9 10.9	- 36 54	2.1
15	1		3269	A 144	9 27.6	- 56 30	3.5
16	L		3280	A 146	9 30.0	-50 43	5.2
17	M		3300	A 148	9 32.6	- 48 49	4'9
18	m		3382	A 163	9 47.2	- 45 59	4.8
19	Q		3472	A 186	10 4.4	-51 13	5*3
20	q		3509	A 191	10 9.7	-41 32	4.0
21	v		3536	A 201	10 15.1	- 54 25	5.4
22	T		3546	A 203	10 16.4	- 55 26	5.0
23	r		3552	A 204	10 17.2	-41 3	5.3
24	P		3589	A 195 C.	10 23.0	-57 I	5.4
25	s		3613	A 216-7	10 26.8	-44 27	5'4
E Man				3800			HE SERVER
26	p		3644	A 222	10 32.2	-47 36	4·I
27	X		3658	A 225	10 34.2	- 54 58	4.8
28	i		3772	A 239	10 54.6	- 4I 34	4.2

Lac. 3180 (5.9); Lac. 3187 (5.9); Lac. 3228 (5.8); Lac. 3337 (5.7); F (5.7); C (5.6); Lac. 3486 (5.9); Lac. 3492 (5.9); D (5.8); g (5.7); f (5.6); Lac. 3596 (5.8); Lac. 3635 (5.9); Lac. 3667 (5.9); Lac. 3723 (5.6); z (5.9); Lac. 3764 (5.6); Lac. 3765 (5.8); Lac. 3786 (5.8); I (5.8); Lac. 3894 (5.9); 3917 (5.6); O (5.8); u (5.6); Gilliss 1186 (5.7); Lac. 4206 (5.8); Lac. 4336 (5.6); t (5.6); Lac. 4648 (5.8).

8. ARIES.

Fr. Le Bélier; Germ. Der Widder.

				R.A.	Decl.
				h. m.	0
Meridional Cent	tre of Constellat	ion	 	2 30	+ 20
A			 	I 40	
Approximate	Following		 	3 20	
Boundaries,	North		 		+ 30
1900.	South .		 		+10

In the head of Aries there are 3 stars which serve to indicate the position of the constellation, but otherwise it offers to the naked eye nothing to attract notice. These 3 stars are:-

			Mag.	
a	 	 	2.0	
β	 	 	2.8	
Y	 	 	4·I	

41 Arietis is of mag. 3.8, and besides γ there are 13 stars between 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude Harv. or Arg. : Oxford.
Q J. S.					h. m.	0 ,	
1	γ1	5	572	291	1 46.9	+ 18 42	5.01
2	γ^2	5	573	292	1 46.9	+ 18 42	5.1}: 4.1
3	β	6	577	295	1 48.0	+ 20 13	2.8 : 2.7
4	,	8	592	299	1 50.8	+ 17 14	5.3 : 2.3
5	λ	9	593	303	1 51.1	+ 23 1	4.9 : 4.9
6	ĸ.	12	644	222	* #010	+ 22 5	5.2 : 5.3
	2000			332	1 59.8		
7	a	13	648	333	2 0.4	+ 22 54	5.0 : 5.1
8		14	657	337	2 2.6	+ 25 23	2.1 : 2.0
9		35	831	432	2 36.4	+ 27 12	4.7 : 4.5
10		38	844	435	2 38.4	+ 11 57	5.3 : 2.4
			ALC: N	10000			
11		39	861	439	2 40.8	+ 28 45	4.6 : 5.1
12		41	872	445	2 42.9	+ 26 46	3.8 : 3.6
13	€	48	921	472	2 52.4	+ 20 52	4.6 : 4.5
14	δ	57	986	505	3 4.8	+ 19 16	4'5 : 4'5
15	5	58	999	515	3 8.0	+ 20 56	4.9 : 4.8

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
				1	h. m.	0 ,	
16			1025	528	3 13.1	+ 28 37	4.7 : 4.8
17	τ^1	61	1034	535	3 14.3	+ 20 43	5'2 : 5'4
18	72	63	1045	542	3 15.8	+ 20 19	5.3 : 2.4

 η (5.4); θ (5.6); ξ (5.4); ν (5.4); Fl. 33 (5.4); μ (5.8); o (5.8); σ (5.5); ρ (5.5); Fl. 55 (5.5); Fl. 56 (5.5).

9. AURIGA.

Fr. Le Cocher; Germ. Der Fuhrmann.

			R.A.	Decl.
		3 - 10	h. m.	0
Meridional Cent	tre of Constellation	 	6 0	+42
A	Preceding	 	4 40	
Approximate Boundaries.	Following	 	7 20	
	North	 		+ 57
1900.	South	 		+ 27

Auriga is a constellation of large extent and with one star in particular, Capella, which in the absence of all others would suffice to make the constellation conspicuous. The chief stars are:—

		Mag.	1		Mag.
a (Capella)	•••	0.2	•	 	 3.2
β		2.1	η	 	 3.3
θ		2.7	δ	 	 3.8
t		2.7			

There are 28 stars between 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R. A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
				200	h. m.	0 /	CHARLES I
1		1	1476	835	4 41.8	+ 37 17	5.5 : 2.3
2		2	1492	844	4 44.6	+ 36 31	5.0 : 2.0
3	ı	3	1520	862	4 49'2	+ 32 58	2.7 : 2.9
4		4	1530	873	4 51.1	+ 37 42	2.1 : 2.3
5	€	7	1540	877	4 53'4	+ 43 39	3.5 : 3.6
6	5	8	1541	879	4 54°I	+40 54	4.0 : 3.8
7		9	1554	891	4 57.3	+ 51 26	4.9 : 2.1

I roles		1			AUGUST OF THE		principle to the
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 /	
8	η	10	.1558	896	4 58.1	+41 4	3'3 : 3'5
9	μ	11	1602	922	5 5.3	+ 38 20	4'9 : 5'1
10		14	1614	930	5 7.6	+ 32 33	5.3 : 2.3
11	а	13	1613	932	5 7.8	+ 45 52	0.5 : 0.1
12		16	1627	942	5 10.3	+ 33 15	5.0 : 2.0
13	λ	15	1631	944	5 10.7	+40 0	5.0 : 2.0
14		19	1636	949	5 12.1	+ 33 50	5.1 : 2.4
15	ρ	20	1645	954	5 13.4	+41 41	5.1 : 2.4
16	σ	21	1663	965	5 16.5	+ 37 16	5.2 : 5.4
17	X	25	1723	1001	5 24.6	+32 6	5.0 : 2.1
18	τ	29	1830	1063	5 40.9	+ 39 8	4.6 : 4.8
19	υ	31	1844	1072	5 43.0	+ 37 16	5.3 : 2.1
20	ν	32	1845	1073	5 43.2	+ 39 7	4.2 : 4.3
21	E	30	1854	1079	5 44.8	+ 55 41	5.0 : 2.0
22	δ	33	1885	1093	5 49.6	+ 54 16	3.3 : 4.0
23	β	34	1895	1100	5 50.7	+ 44 57	2.1 : 1.9
24	π	35	1897	1102	5 51.0	+ 45 56	4.5 : 4.7
25	θ	37	1900	1104	5 51.5	+37 12	2.7 : 3.0
26	к	44	2001	1161	6 7.7	+ 29 32	4.2 : 4.8
27	ψ^1	46	2044	1193	6 15.7	+49 21	5.0 : 2.5
28		48	2082	1211	6 20.9	+ 30 34	5.2 : 5.2
29		49	2133	2239	6 27.7	+ 28 7	4.9 : 4.9
30	¥3	52	2156	1245	6 30.5	+40 0	5.1 : 2.3
- 75/79	.12				(0		7 2 1 3 1 6
31	ψ2	50	2159	1247	6 30.8	+ 42 36	5.3 : 2.1
32	ψ^4 ψ^7	55	2182	1255	6 34.4	+ 44 39	5.5 : 2.5
33	ψ^{10}	58	2223	1287	6 42.3	+41 56	5.0 : 2.1
34 35	Ψ	63	2261	1310	6 48.9	+ 45 17 + 39 31	4.7 : 5.0
95		0,5	4330	1340	7 3 4	1 39 31	3250

H.P. 843 (5.5); B.A.C. 1632 (5.3); H.P. 947 (5.3); H.P. 958 (5.5); ϕ (5.3); o (5.4); Fl. 36 (5.5); Fl. 40 (5.3); Fl. 45 (5.5); Fl. 53 (5.5); ψ^5 (5.4); ψ^6 (5.3); H.P. 1274 (5·3); ψ^8 (5·4); ψ^9 (5·9); Fl. 65 (5·3); Fl. 66 (5·3).

10. BOÖTES.

Fr. Le Bouvier; Germ. Bootes.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constella	ation	 	14 35	+30
A	Preceding		 	13 40	
Approximate	Following		 	15 20	
Boundaries,	North		 	PET TREE	+ 55
1900.	South		 		+ 6

Boötes is one of the largest and most important of the Northern constellations, and possesses in Arcturus one of the most brilliant, perhaps the most brilliant, of the Northern stars, its rivals being Capella (a Aurigæ) and Vega (a Lyræ). Its chief stars are:—

	Mag.	1		Mag.
a (Arcturus)	 0.0	8	 	 3.5
€	 2.6			
η	 2.9	ρ	 	 3.6
γ	 3.1	5	 	 3.8

There are 28 stars between 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
			Office	7 7 7 7	h. m.	0 /	STATE OF THE STATE OF
1	7	4	4597	2333	13 41.6	+ 18 3	4.5 : 4.6
2	v	. 5	4615	2343	13 43.7	+ 16 24	4.1 : 3.9
3	e	6	4618	2344	13 44.0	+ 21 52	5.0 : 4.9
4	η	8	4648	2360	13 49.0	+19 0	2.9 : 2.7
5		9	4656	2365	13 51.1	+ 28 5	5.1 : 2.0
100							
6	d	12	4706	2385	14 4.9	+ 25 40	4.8 : 4.8
7		15	4724	2394	14 9.0	+ 10 40	5.5 : 2.4
8	к	17	4726	2395	14 9.2	+ 52 21	4.4 : 4.2
9	a	16	4729	2400	14 10.2	+ 19 48	0.0 : 0.3
10	λ	19	4741	2403	14 11.8	+ 46 38	4.3 : 4.5
				12 13 13		TANK STATE	
II	1	21	4742	2404	14 11.9	+ 51 55	4.8 : 4.6
12	A	3	4747	2409	14 13.0	+ 36 4	4.8 : 5.0
13		18	4751	2411	14 13.5	+ 13 34	5.3 : 2.3
14		20	4753	2413	14 14.1	+ 16 51	4.9 : 4.6
15			4766	2420	14 17.5	+90	5.0 : 2.3

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford
NEW YEAR	2021				h. m.	0 /	Se Steens
16			4773	2423	14 18.2	+ 6 22	5.0 : 2.5
17	θ	23	4789	2426	14 21'0	+ 52 24	4.3 : 4.0
18	ρ	25	4808	2433	14 26.7	+ 30 54	3.6 : 3.6
19	γ	27	4812	2436	14 27.2	+ 38 50	3.1 : 3.5
20	σ	28	4823	2442	14 29.5	+ 30 16	4.2 : 4.6
21	π	29	4847	2449	14 35.1	+ 16 56	4.6 : 4.6
22	5	30	4849	2452-3	14 35.4	+ 14 15	101
23		31	4850	2454	14 35.8	+ 8 41	3.8 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
24		34	4864	2459	14 38.5	+ 27 3	4.9 : 4.8
25	0	35	4873	2466	14 39 7	+ 17 29	4.8 : 4.6
-5	The state of	99	40/3	2400	-4 39 7	. 1 -7 -9	40.40
26	€	36	4876	2467	14 39.8	+ 27 35	26: 2.5
27	E	37	4905	2489	14 45'9	+ 19 36	4.6 : 4.6
28	ω	41	4953	2513	14 56.9	+ 25 29	4'9 : 4'7
29	β	42	4958	2515	14 57.4	+ 40 52	3.6 : 3.6
30	ψ	43	4969	2520	14 59'3	+ 27 25	4.2 : 4.4
31	i	44	4974	2521	14 59.8	+48 7	4.9 : 4.6
32	c	45	4981	2527	15 2.0	+ 25 20	5.0 : 2.1
33	δ	49	5036	2541	15 10.7	+ 33 46	3'5 : 3'4
34	μ	51	5084	2561	15 20.0	+ 27 48	4'4 : 4'5
35	ν4	52	5122	2583	15 26 6	+41 14	5.1 : 4.6
36	ν2	53	5130	2584	15 27.5	+41 18	5.0 : 2.0

Fl. 10 (5·3); B.A.C. 4699 (5·5); Fl. 13 (5·5); Fl. 14 (5·5); f (5·4); Fl. 33 (5·3); Fl. 39 (5·5); B.A.C. 4906 (5·5); Fl. 40 (5·4); χ (5·3); ϕ (5·4).

11. CÆLA SCULPTORIS [CÆLUM].

Fr. Les Burins; Germ. Der Grabstichel.

				R.A.	Decl.
- Sept				h. m.	0
Meridional Cen	tre of Constella	tion	 	4 40	-42
	/ Preceding		 	4 20	
Approximate	Following		 	5 10	
Boundaries,	North		 		-30
1900.	South		 		-50

Cæla Sculptoris, more generally known as Cælum (a graving tool), is a small Southern constellation the brightest star of which, (a), is only of mag. 4.6, γ being 4.7; and there are 2 others brighter than $5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
	δ				h. m.	0 ,	
1	0	•••	1413	A 7	4 27.2	— 45 13	5.0
2	a	•••	1458	A 9	4 36.7	-42 6	4.6
3	β		1464	A 10	4 37.8	-37 23	5.1
4	γ'		1573	A 28	2 0.1	-35 39	4.7

No stars within the limits 5.5 to 5.9.

12. CAMELOPARDUS.

Fr. La Girafe; Germ. Die Giraffe.

			R.A.	Decl.
	Description of the second		h. m.	0
Meridional Cer	atre of Constellation	 	5 40	+70
Approximate	/ Preceding	 	3 0	
Boundaries,	Following	 	8 0	
	North	 		+85
1900.	South	 		+ 53

Camelopardus is a long straggling constellation with a large number of medium stars (mags. ± 4), but no conspicuous ones; the 2 brightest of all (B.A.C. 1058, and β) only attaining to mag. 4.2. Altogether there are 22 stars between 4—5.2 mags.

N	0.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford. or Arg. :
				02 0000		h. m.	0 /	
	I	***		1001	516	3 9.5	+65 13	4.8 : 4.7
	2			1058	551	3 19'4	+ 59 31	4.2 : 4.2
1	3			1062	553	3 20.3	+ 58 28	4.8 : 4.7
-	4			1065	557	3 20.9	+55 2	2.0 : 2.1
	5			1111	583	3 31.8	+62 50	5.3 : 2.3
MI		91.64	SECTION .	Personal Personal	Edit In			5.0 : 5.2
(5			1133	596	3 35.6	+ 62 58	
1	7	γ		1137	607	3 37.7	+ 70 58	4.6 : 4.5

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
SECTION AND ADDRESS OF		Per Maria			h. m.	0 ,	
8			1144	612	3 38.2	+65 9	4.6 : 4.7
9			1203	639	3 46.8	+ 62 43	4.8 : 5.0
10			1204	641	3 46.9	+ 60 45	5.1 : 5.3
11			Year	650	3 54.6	+ 58 49	4.9 : 5.1
William .			1237	659			
12			1293	711	• 4 7.4	+ 53 18	2.5 : 2.1
13	a	9	1474	836	4 42.1	+66 8	4.4 : 4.2
14		7	1504	856	4 47.7	+ 53 34	4.5 : 4.7
15	β	10	1536	876	4 52.7	+60 16	4.5 : 4.3
16		11	1546	885	4 55.7	+ 58 48	5.1 : 2.5
17			1565	913	5 2.8	+79 5	2.1 : 2.1
18		31	1849	1078	5 44.2	+ 59 52	5.2 : 5.5
19			1980	1155	6 5.6	+ 69 22	4.7 : 4.6
20		42	2198	1270	6 38.4	+ 67 42.	4.9 : 4.9
also.	win or	-6				Tell be to the	
21		43	2209	1279	6 40.8	+69 T	5.1 : 2.0
22			2210	1288	6 42.6	+77 8	4.6 : 4.7

H.P. 598 $(5\cdot3)$; B.A.C. 1300 $(5\cdot5)$; Fl. 1 $(5\cdot5)$; Fl. 2 $(5\cdot5)$; Fl. 3 $(5\cdot4)$; Fl. 4 $(5\cdot4)$; B.A.C. 1549 $(5\cdot5)$; Fl. 16 $(5\cdot3)$; Fl. 37 $(5\cdot3)$; Fl. 36 $(5\cdot3)$; Fl. 40 $(5\cdot5)$; B.A.C. 2095 $(5\cdot5)$; B.A.C. 2326 $(5\cdot3)$; B.A.C. 2590 $(5\cdot3)$; Fl. 55 $(5\cdot5)$; B.A.C. 3528 $(5\cdot3)$.

13. CANCER.

Fr. Cancre or L'Écrevisse; Germ. Der Krebs.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	8 30	+ 20
Approximate	/ Preceding	 	7 50	
Boundaries,	Following	 	9 20	
	North	 		+ 35
1900.	South	 		+ 9

Cancer has no more conspicuous star than β of mag. 3.8, but the cluster Præsepe (M 44) will serve to indicate this asterism to the naked-eye observer. There are 14 stars between 4—5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. oxford.
					h. m.	0 /	
1		6	2672	1505	7 56.0	+ 28 8	5.0 : 2.1
2		8	2690	1507	7 58.4	+ 13 28	2.1 : 2.1
3	μ	10	27.14	1511	8 0.7	+ 21 56	5.5 : 2.2
4	5	16	2744	1521	8 5.3	+ 18 1	4.7 : 4.9
5	β	17	2778	1533	8 10.0	+ 9 33	3.8 : 3.7
			06				
6	X	18	2786	1536	8 12.8	+ 27 37	5.1 : 2.3
7			2822	1553	8 19.2	+ 7 57.	5.1 : 5.4%
8	γ	43	2937	1597	8 36.3	+ 21 55	4.8 : 4.9
9	δ	47	2953	1602	8 37.9	+ 18 36	4.3. : 4.3
10	ı	48	2965	1605	8 39'4	+ 29 12	4.2 : 4.2
No.							
11	p ²	58	3026	1626	8 48.5	+ 28 23	
12	0	62	3047	1634	8 50.6	+15 47	5.2 : 2.2
13	a	65	3055	1639	8 51.9	+.12-19	4'3 : 4'4
14	к	76	3111	1659	9 1.3	+11 9	5.0 : 2.3
15	€	77	3117	1661	9 2.2	+ 22 31	5.5 : 2.5

 $\begin{array}{c} \omega \ (5.9) \ ; \ \psi \ (5.8) \ ; \ \lambda \ (5.7) \ ; \ \phi^1 \ (5.9) \ ; \ \phi^2 \ (5.5) \ ; \ \theta \ (5.8) \ ; \ \eta \ (5.5) \ ; \ \nu^2 \ (5.9) \ ; \ v^3 \ (5.8) \ ; \\ \epsilon \ (\text{Præsepe}) \ ; \ \sigma^1 \ (5.7) \ ; \ \sigma^2 = \text{Fl. } 57 \ (5.5) \ ; \ \text{Fl. } 59 \ (5.5) \ ; \ \nu \ (5.6) \ ; \ \tau \ (5.4) \ ; \ \pi \ (5.6). \end{array}$

14. CANES VENATICI.

W. All rai Contro of County is a

Fr. Les Lévriers; Germ. Die Jagdhunde.

11			Acres of the latest th	
		F-Dia	R.A.	Decl.
		11101	/ h. m.	0
Meridional Cent	re of Constellation	*	13 0	+40
Destruction and	Preceding	B. B. 655	12.0	
Approximate	Following	11.0.00	14 5	
Boundaries,	North		14 15	+ 54
1900.	South	C. ala	4 9119 1177	+ 30

This constellation has but one conspicuous star, a, called also Cor Caroli, of mag. 3. It was this star which, with a few near it, Halley desired to form into a separate constellation to commemorate King Charles II., and even now celestial atlases and globes will sometimes be met with in which this star is placed in the centre of a heart surmounted by a crown. There are 10 stars between 4—5.2 mags.

Ī	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
	Male		100		100	h. m.	0 ,	
ı	I			4128	2082	12 10'5	+ 33 44	2.1 : 2.1
ı	2		5	4180	2102	12 18.2	+ 52 12	5.0 : 2.3
ı	3	β	8	4235	2133	12 28.0	+42 1	4.3 : 4.5
ı	4	a	12	4346	2195	12 50.4	+ 38 58	3.0 : 3.3
ı	5			4433	2237	13 8.3	+ 40 47	5.0 : 2.0
ı	6		20	4451	2248	13 12.2	+41 12	4.7 : 4.7
ı	7		21	4456	2253	13 13.1	+ 50 19	5.5 : 2.0
ı	8			4536	2297	13 29.4	+ 37 48	5.0 : 2.0
	9		24	4538	2299	13 29.6	+ 49 38	4.8 : 5.0
	10		25	4552	2304	13 33.1	+ 36 54	5.0 : 2.1
	11			4632	2352	13 46.5	+ 35 2	4.9 : 2.5

Fl. 6 (5·3); B.A.C. 4233 (5·3); Fl. 14 (5·3); B.A.C. 4600 (5·5).

15. CANIS MAJOR.

Fr. Le Grand Chien; Germ. Der Grosse Hund.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	6 40	-24
Approximate	/ Preceding	 	6 10	
Boundaries,	Following	 	7 15	
	North	 		-10
1900.	South	 		-35

Canis Major is quite a small constellation as regards its area, but it contains a large number of conspicuous stars, including the brightest of all the stars, Sirius. The following are the important stars:—

	Mag.		Mag.
a (Sirius)	1.4	ζ	3.0
€	I·5	o ²	3.0
δ	1.8	22	3.5
β	2.0	28	3.7
η	2.4	κ	3.9

Besides these, Canis Major contains 31 stars of mags. 4—5.2, and therefore may be ranked as decidedly a bright constellation.

No. Letter. Flam. B.A.C. Continue of the late of the la		1	1					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	No.	Letter.		B.A.C.	or Argent.	1880.		The second secon
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$						h. m.	0 ,	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1				1177	6 10.3	- 13 40	4.8
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	2		•••		1183	6 12.4	- 16 46	5.1
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3				1186	6 13.2		
5 β 2 2061 1201 6 17·4 -17.54 2·0 6 3 2066 1203 6 17·7 -33 22 4·1 7 λ 2109 1222 6 23·7 -32 30 4·1 8 ξ¹ 4 2132 1235 6 26·9 -23 19 4·2 9 ξ² 5 2160 1242 6 30·0 -22 52 4·4 10 ν² 7 2171 1251 6 31·5 -19 9 4·2 11 ν² 8 2174 1253 6 32·6 -18 8 4·7 12 1254 6 33·8 -14 2 5·0 13 a 9 2213 1275 6 39·9 -16 33 -1·4 + 1·9 15 11 2221 1283 6 41·4 -14 18 4·9 16 κ 13 2246 1300 6 45·4 -32	4	5	I	2051	1195	6 15.7		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	5	β	2	2061	1201	6 17.4	- 17.54	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	6		3	2066	1203	6 17.7	- 33 22	4.1
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	7	λ		2109	-			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	8	€1	4	TO STATE OF	1235		PER GILL	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	9	₹2	5	2160	1242			
11 ν³ 8 2174 1253 6 32.6 — 18 8 4.7 12 1254 6 33.8 — 14 2 5.0 13 α 9 2213 1275 6 39.9 — 16 33 — 1.4 + 1.9 14 10 2214 1276 6 39.9 — 30.57 5.2 15 11 2221 1283 6 41.4 — 14 18 4.9 16 κ 13 2246 1300 6 45.4 — 32 22 3.9 17 2252 A37Pup. 6 46.5 — 34 14 5.4 18 15 2263 1308 6 48.4 — 20.5 4.4 19 θ 14 2264 1309 6 48.1 — 11 53 4.2 20 o¹ 16 2267 1312 6 49.2 — 24 2 4.0 21 19 2272 1315 6 50.4 — 19 59 4.4 22 μ 18 2273 1316	10	ν^2		2171	8-	To be the first of		CI STATE OF THE PARTY OF
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	11	ν3	8	2174	1252			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	533		4		BATCH GROUND		The state of the s	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1500							
15 11 2221 1283 6 41·4 14 18 4'9 16 κ 13 2246 1300 6 45·4 32 22 3'9 17 2252 A37Pup. 6 46·5 34 14 5·4 18 15 2263 1308 6 48·4 20 5 4·4 19 θ 14 2264 1309 6 48·1 11 53 4·2 20 0^1 16 2267 1312 6 49·2 24 2 4·0 21 19 2272 1315 6 50·4 19 59 4·4 22 μ 18 2273 1316 6 50·6 13 53 5·2 23 1317 6 50·7 22 47 5·2 24 1 20 2274 1318 6 50·8 16 54 4·5 25 2281 1320 6 52·6 24 29 5·2 26 ϵ 21 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>with the second section</td><td></td><td>And the second second</td></t<>						with the second section		And the second second
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1000	12	1					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		14.34					14 10	49
$\begin{array}{cccccccccccccccccccccccccccccccccccc$							- 32 22	3.9
$\begin{array}{cccccccccccccccccccccccccccccccccccc$								5.4
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	72.00		-	45 6			- 20 5	4.4
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1850				1309	6 48.1	— 11 53	4.5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	20	0,	16	2267	1312	6 49.2	- 24 2	4.0
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	21		19	2272	1315	6 50.4	- 19 59	4.4
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	22	μ	18	2273	1316	6 50.6	- 13 53	5.5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	23				1317	6 50.7	22 47	5.2
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	24		20	2274	1318	6 50.8	- 16 54	4.2
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	25			2281	1320	6 52.6	- 24 29	5.5
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	26	€	21	2293	1325	6 53.9	- 28 48	1.2
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	27	0	22					med to San part of
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	28	02	24					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	29	γ						
31 δ 25 2345 1350 7 3.5 — 26 12 1.8 32 27 2388 1368 7 9.4 — 26 9 4.5 33 28 2391 1370 7 9.9 — 26 34 3.7 34 1372 7 10.8 — 15 23 5.2	30	133						
32 27 2388 1368 7 9.4 -26 9 4.5 33 28 2391 1370 7 9.9 -26 34 3.7 34 1372 7 10.8 -15 23 5.2	31	δ	100	C. San	10000		- 26 12	
33 28 2391 1370 7 9'9 -26 34 3'7 34 1372 7 10'8 -15 23 5'2			Section 1			75-342-264		
34 1372 7 10.8 -15 23 5.2	THE PARTY	THE STATE	2000			The state of the s	, 1	
			the	a de la constant de l		0		
	35				1374	7 11.6	- 23 6	4.7

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. oxford.
		1000	The second	Sections:	h. m.	0 /	
36			2405	1375	7 11.8	- 27 40	4.0
37		29	2417	1380	7 13.7	- 24 20	4.8
38	S	30	2418	1381	7 13.7	- 24 44	4.3
39				1391	7 17.0	- 18 47	4.9
40			2454	1398	7 19.2	- 15 58	4.9
41	η	31	2458	1399	7 19.4	- 29 4	2.4

H.P. 1190 (5.4); H.P. 1226 (5.3); Lac. 2334 (5.8); Lac. 2341 (5.9); B.A.C. 2162 (5·3); Lac. 2374 (5·7); H.P. 1278 (5·3); H.P. 1282 (5·5); H.P. 1291 (5·3); H.P. 1306 (5.5); B.A.C. 2291 (5.4); H.P. 1358 (5.4); H.P. 1383 (5.4).

16. CANIS MINOR.

Fr. Le Petit Chien; Germ. Der Kleine Hund.

				R.A.	Decl.
				h. m.	0
Meridional Cen	****	7 30	+ 6		
	/ Preceding		1	7 0	
Approximate	Following			8 0	
Boundaries,	North				+ 12
1900.	South	- · · ·			+ 1

Canis Minor will always be readily found by reason of its conspicuous leader Procyon, of mag. 0.5 of the Harvard scale, the Oxford value being substantially the same. The only other important star is β of mag. 3.1, but there are 6 other stars between 4-5.2 mags., which is a high average for so small an asterism.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford. or Arg. :
					h. m.	0 ,	
1	€	2	2451	1397	7 19.1	+ 9 31	5.0 : 2.1
2	β	3	2462	1403	7 20.6	+ 8 32	3.1 : 3.1
3	γ.	4	2468	1406	7 21.6	+ 9 10	4.6 : 4.8
4		6	2473	1413	7 23.1	+ 12 15	5.0 : 4.9
5	δι	7	2480	1419	7 25.9	+ 2 10	5.1 : 2.0
6	a	10	2522	1442	7 33.0	+ 5 32	0.2 : 0.2
7	5	13	2612	1476	7 45'5	+ 2 4	5.0 : 2.0
8		13	2673	1504	7 56.0	+ 2 40	49 : 4.4

17. CAPRICORNUS.

Fr. Le Capricorne; Germ. Der Steinbock.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	20 50	-20
Approximate	Preceding	 	20 0	
	Following	 	21 45	
Boundaries,	North	 	of the Ottobal	- 9
1900.	South	 		-28

Capricornus is a constellation which has not much to attract the naked eye. Its chief stars are:—

		Mag.	I TE MARK		Mag.
δ		 3.0	ζ	 	3.8
β	built.	 3.4	γ	 	3.8
a ²		 3.8	and water		

together with 16 stars between 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
					h. m.	0 ,	
1	a1	5	6972	3537	20 11.0	— 12 53	4.2
2	a ²	6	6974	3538	20 11.4	— 12 55	3.8
3	ν	8	6991	3552	20 14.0	-13 8	4.7
4	β	9	6995	3554	20 14.3	- 15 10	3.4
5	π	10	7031	3574	20 20.2	- 18 36	5.3
						0	
6	ρ	11	7042	3575	20 22.0	— 18 12	5.0
7	4	16	7177	3638	20 39.0	- 25 42	4.3
8	ω	18	7227	3661	20 44.7	- 27 22	4.4
9	η	22	7305	3706	25 57.6	- 20 2C	5,5
10	θ	23	7322	3712	20 59.2	— 17 43	4.3
11	A	24	7328	3715	21 0.1	- 25 29	4.6
12		32	7407	3756	21 15.6	- 17 21	4.4
13	5	34	7445	3779	21 19'9	- 22 56	3.8
14	b	36	7460	3783	21 21.8	- 22 20	4.2
15	•	39	7506	3800	21 30.4	- 20 O	4.2
TY CO	100		Section 1	5.89 T.F		ALL PARTY	
16	γ	40	7525	3818	21 33.4	- 17 12	3.8
17		41	7539	3822	21 35.2	- 23 48	5.5

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
100					h. m.	0 ,	
18	K	43	7543	3824	21 36.0	- 19 24	4.7
19	c	46	7563	3838	21 38.6	- 9 38	5.3
20	δ	49	7580	3848	21 40.4	- 16 40	3.0
21	μ	51	7618	3864	21 46.8	-14 7	5.5

 σ (5.6); σ (5.6); τ (5.3); ν (5.3); χ (5.3); φ (5.3); Fl. 29 (5.5); Fl. 30 (5.4); Fl. 42 (5·3); λ (5·4).

18. CASSIOPEIA.

	r. Cassiopee	; Ger	m. Cas	ssiopei	a.		
				75 600	R.,	A.	Decl.
					h.	m.	0
Meridional Cen	tre of Constell	ation			I	0	+60
	/ Preceding	•••			23	0	
Approximate	Following			:	3	10	
Boundaries,	North						+77
1900.	South						+ 16

Cassiopeia is a constellation of great extent and of great telescopic interest, owing to the fact that a rich part of the Milky Way runs through it, but the interest of its naked-eye stars chiefly resides in its well-known W group. The chief stars of the constellation are:-

		Mag.			Mag.
α	 	 2.2	η		 3.6
Y	 	 2.3	€		
β	 	 2.4	\$	2	 3.7
δ		 2.8			

and there are 31 stars between 4-5.2 mags.

Ī	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
		N DE		ALC: WALL	107 734	h. m.	0 /	
ı	1		. 1	8054	4086	23 1.5	+ 58 47	5.0 : 2.5
1	2		4	8162	4144	23 19.5	+61 37	5.3 : 2.2
ı	3			8188	4153	23 24.5	+ 57 53	4.8 : 4.9
ı	4	τ	5	8268	4201	23 41.2	+ 57 59	5.3 : 2.1
ı	5	ρ.	7	8310	4224	23 48.4	+ 56 50	4.6 : 4.8
ı	6	σ	8	8330	4237	23 53.0	+ 55 5	5.0 : 2.0
1	7	β	11	7	9	0 2.8	+ 58 29	2.4 : 2.3

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford. or Arg. :
					h. m.	0 /	
8	λ	14	121	69	0 25.1	+ 53 50	4.8 : 4.9
9	к	15	126	71	0 26.2	+62 16	4.3 : 4.3
10		F	146	77	0 29.5	+ 53 30	5.0 : 2.2
11	5	17	153	82	0 30.3	+ 53 14	3.7 : 3.7
12	a	18	169	94	0 33.7	+ 55 53	2.2 : 2.4
13	1 8	19	180	100	0 35.5	+49 51	4.8 : 5.2
14	π	20	189	102	0 36.8	+46 22	5.0 : 5.0
15	0	22	198	107	0 38.0	+ 47 38	4.6 : 4.8
16	η	24	218	120	0 41.8	+ 57 11	3.6 : 3.4
17	ν	25	219	121	0 42.0	+ 50 19	5.0 : 4.9
18			239	136	0 45.9	+ 60 27	4.9 : 2.1
19	v1	26	244	139	0 47'9	+ 58 19	2.1 : 2.1
20			245		0 48.3	+48 2	5
21	γ	27	253	142	0 49.5	+60 4	2.3 : 2.2
22	v2	28	254	143	0 49'5	+ 50 31	4.9 : 4.9
23	μ	30	314	175	I 0.4	+ 54 20	5.2 : 5.4
24	θ	33	339	189	1 3.0	+ 54 31	4.4 : 4.7
25	φ	34	391	208	1 12.6	+ 57 36	5.3 : 2.1
26	¥	36	412	218	1 17.5	+67 30	4.8 : 5.0
27	δ	37	416	219	1 18.0	+ 59 37	2.8 : 2.9
28	X	39	456	241	1 26.1	+ 58 37	4.9 : 5.0
29		42	499	260	1 33.8	+70 0	5.1 : 5.3
30	•	45	564	287	1 45.8	+63 5	3.6 : 3.2
31	ω	46	568	290	1 46.8	+68 5	5.1 : 4.9
32			588	300	1 50.9	+64 2	5.5 : 2.4
33		48	595	304	1 52.1	+70 19	4.6 : 4.8
34		50	600	306	I 53.2	+71 50	4.1 : 4.4
35			744	384	2 19.2	+66 52	4.6 : 4.4
36			955	493	2 58.9	+73 56	4.7 : 4.8
37			1001	516	3 9'5	+65 13	4.8
38			1211	650	3 50.0	+80 22	5.3

Fl. 2 (5·4); B.A.C. 8083 (5·5); Fl. 6 (5·5); B.A.C. 8322 (5·5); Fl. 10 (5·5); B.A.C. 79 (5·4); Fl. 12 (5·4); B.A.C. 197 (5·5); B.A.C. 201 (5·4); Fl. 23 (5·3); B.A.C. 228 (5·4); B.A.C. 255 (5·5); Fl. 31 (5·3); B.A.C. 335 (5·4); Fl. 32 (5·5); Fl. 40 (5·5); Fl. 43 (5·5); Fl. 44 (5·5); Fl. 47 (5·4); Fl. 49 (5·3); Fl. 53 (5·5); B.A.C. 777 (5·3).

19. CENTAURUS.

Fr. Le Centaur; Germ. Der Centaur.

			R.A.	· Decl.
- Table 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1			h. m.	0
Meridional Cen	tre of Constellation	ı	 13 20	-47
Annuarimata	Preceding		 10 45	
Approximate Boundaries.	Following		 14 40	
1900.	North	3		-33
1900.	South			-62

Centaurus is a large and important Southern constellation, rich in bright stars, the whole of which are unfortunately invisible in England. The prominent stars are :-

1		Mag.	1 10,000			Mag.
a^2	 	 1.0	δ	 		2.8
β	 	 1.2		 		3.0
θ	 	 1.7	к	 	***.	3.3
7	 	 2.4	λ	 		3.4
η	 	 2.5	μ	 		3.4
•	 	 2.6	a ¹	 	•••	$3\frac{1}{2}$
5	 	 2.7	ν	 		3.7

and there are 42 stars between 4-51 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
100					h. m.	0 ,	
I	π		3866	A 24	11 15.6	- 53 50	4.3
2			3907	A 34	11 22.8	-42 o	5'4
3		Lac. 4774		A 37	11 26.2	- 58 46	5.2
4		Lac. 4775		A 38	11 26.3	- 58 51	5.2
5			3935	A 42	11 28.8	— 53 34	5.3
6		Brisb. 3663	} 3938	A 45	11 30.1	-46 58	5.5
7	λ		3941	A 46	11 30.3	-62 21	3°4
8		•••	3986	A 65	11 40.7	-60 30	4.7
9			3988	A 66	11 40.8	-39 50	5.4
10			4000	A 69	11 43.8	-63 7	4.9
		10 12	20 月計	307 1	1		MARKET STATE
11		•••	4007	A 71	11 45.1	-44 30	5.0
12	δ	•••	4087	A 94	12 2.1	-50 3	2.8
13	ρ		4103	A 101	12 5.4	-51 42	4.2
14	κ^1	•••	4174	A 113	12 17'3	- 34 44	5.2
15	σ		4197	A 121	12 21.6	-49 34	4'3

	T		1				
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
				100	h. m.	0 ,	
16	7		4251	A 131	12 31.1	-47 53	4.4
17			4262	A 132	12 33.4	-39 20	5.5
18	γ		4264	A 134	12 34.9	-48 18	2.4
19			4272	A 136	12 35.9	-48 9	5.4
20			4309	A 143	12 44.2	-33 20	5.3
21			4317	A 149	12 46.3	-48 17	50
22			4321	A 150	12 46.8	-39 32	4.4
23			4325	A 52 Cruc.	12 47.6	- 56 32	4.4
24		1	4377	A 171	12 59.3	-47 49	5.3
25	<i>ξ</i> ²		4379	A 173	12 59.9	-49 16	4.8
26			4412	A 183	13 4.8	- 59 16	\$100 to 100 to 1
27			4417	A 185	13 5.3	-37 10	5.4
28	ı		4458	A 204	13 13.9	- 36 5	3.0
29			4463	A 208	13 14.9	-60 21	5.5
30			4507	A 227	13 24.1	- 38 47	4.5
31	€		4549	A 245	13 32'3	-52 51	2.6
32	i	Í	4579	A 265	13 38.9	-32 26	4.2
33			4580	A 266	13 39.1	-50 50	5.5
34	ν		4601	A 272	13 42'3	-4I 5	3.7
35	μ		4602	A 273	13 42.4	-41 53	3.4
36		2	4603	A 274	13 42.5	-33 51	4.6
37	k	3	4623	A 280	13 44.9	-32 24	4.7
38	h	4	4629	2349	13 46.3	- 3I 20	4.7
39	5		4638	A 289	13 48.0	-46 42	2.7
40	φ		4653	A 296	13 51.0	- 4I 32	4.1
41	v¹	BOY.	4654	A 297	13 51.3	-44 13	4.5
42	v^2		4668	A 303	13 54.2	-45 I	5.0
43	β		4669	A 304	13 55.4	-59 48	1.5
44	x		4681	A 311	13 58.7	-40 36	4.8
45	θ	5	4686	2379	13 59.6	-35 47	1.7
46			4695	A 321	14 1'9	-52 5I	5'4
47			4735	A 336	14 11.0	-55 49	5.0
48	Ψ		4745	A 338	14 13.3	-37 20	4.4
49			4759	A 342	14 15.7	- 38 58	4.9
50	η		4811	A 356	14 27.9	-41 38	2.5
	- Land			I la Training	Marine Inches	Service Control	

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 ,	
51	a ¹		4831	A 363	14 31.4	-60 20	31/2
52	a ²		4832	A 364	14 31.2	- 60 20	I.2
53			4842	A 368	14 34'5	- 37 16	4.3
54			4852	A 371	14 36.3	- 34 39	4.3
55			4858	A 372	14 37.6	-34 40	5.4
-6			0	1.00	•		
56	K		4928	A 386	14 51.4	-41 37	3.3

Lac. 4603 (5.5); Lac. 4649 (5.8); Lac. 4747 (5.7); Lac. 4785 (5.7); Lac. 4816 (5.9); Lac. 4815 (5.9); Lac. 4856 (5.7); Lac. 4868 (5.8); Lac. 4878 (5.9); Lac. 4992 (5.7); Lac. 5029 (5.8); Lac. 5037 (5.9); Lac. 5069 (5.8); Lac. 5092 (5.8); Lac. 5142 (5.8); Lac. 5150 (5.7); Lac. 5164 (5.9); Lac. 5211 (5.7); Lac. 5331 (5.8); ξ^1 (5.8); Lac. 5422 (5.7); Lac. 5437 (5.9); B.A.C. 4437 (5.5); Lac. 5531 (5.9); ω (4); Lac. 5552 (5.8); Lac. 5632 (5.7); Lac. 5676 (5.8); Lac. 5700 (5.9); Lac. 5733 (5.7); Lac. 5850 (5.6); Lac. 5875 (5.9); Lac. 5875 (5.9); Lac. 5893 (5.6); Lac. 6146 (5.8).

20. CEPHEUS.

Fr. Céphée; Germ. Cepheus.

			R.A.	Decl.
			h. m.	0
Meridional Cent	re of Constellation	 	22 0	+70
Annovimata	Preceding	 	20 20	
Approximate Boundaries,	Following	 	24 0	
	North	 		+85
1900.	South	 		+ 55

Cepheus is a large and straggling constellation reaching nearly to the North Pole and without any very conspicuous stars. The chief are:—

		Mag.	1		Mag.
a (Alde	ramin)	 2.6	η	 	 3.6
β		 3.4		 	 3.6
γ		 3.4	μ	 	 3.9
\$		 3.5			

and there are 20 stars between 4-5.2 mags.

	-1		1				
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 /	COLUMN TO SERVICE STATE OF THE
I			6867	3468	19 53.6	+ 58 32	5.5
2	к	I	7005	3545	20 12.9	+77 21	4.4 : 4.5
3	θ	2	.7098	3594	20 27.6	+62 35	4'3 : 4'2
4		•••	7215	3653	20 42.4	+57 9	4.6 : 4.7
5	η	.3	7222	3656	20 42.8	+61 22	3.6 : 3.5
6	a		7116	0.7.4			
7	β	* 5 8	7416	3757	21 15.7	+62 5	2.6 : 2.6
8			7493	3798	21 27.1	+ 70 2	3.4 : 3.4
		9	7542	3819	21 34.7	+61 32	4.8 : 5.0
9	μ		7582	3845	21 40.0	+ 58 14	3.9 : 4.2
10		11	7588	3847	21 40.5	+ 70 46	4.8 : 4.9
11	ν	10	7595	3855	21 42.0	+60 34	4.5 : 4.8
12			7658	3879	21 53.2	+63 3	5.2 : 5.4
13		16	7686	3892	21 57.5	+ 72 36	5.2 : 5.4
14	8	17	7700	3903	22 0.3	+64 3	4.4 : 4.7
15		19	7708	3909	22 1.5	+61 42	5.2 : 5.4
16	5	21	7749	3923	22 6.7	+ 57 37	3.2 : 3.4
17		24	7758	3925	22 7.5	+ 71 45	5.0 : 4.7
18	€	23	7778	3942	22 10.6	+ 56 27	4.5 : 4.4
19	δ	27	7848	3981	22 24.7	+ 57 48	4.0 : 4.5
20		30	7902	4009	22 34.4	+ 62 58	5.3 : 2.4
21	ı	32	7967	4037	22 45.4	+ 65 34	3.6 : 3.6
22			7990	4045	22 47.9	+82 31	4.8 : 5.0
23			8026	4071	22 55.3	+83 42	5.0 : 2.3
24	π	33	8074	4098	23 4.1	+ 74 44	4.5 : 4.7
25	0	34	8124	4127	23 13.8	+ 67 28	4.9 : 2.5
		74	STELL SE		3 -3 3		
26	γ	35	8238	4182	23 34'4	+ 76 58	3.4 : 3.5
27			8273	4204	23 42.2	+67 8	5.1 : 5.3
B BA		100				Charles III	

B.A.C. 225 (5.5); B.A.C. 979 (5.5); B.A.C. 1247 (5.4); B.A.C. 1448 (5.3); B.A.C. 2157 (5.3); Fl. 4 (5.5); B.A.C. 7377 (5.5); Fl. 6 (5.3); Fl. 7 (5.4); B.A.C. 7495 (5.4); B.A.C. 7545 (5.5); Fl. 14 (5.5); Fl. 18 (5.4); Fl. 20 (5.4); B.A.C. 7754 (5.4); λ (5.3); B.A.C. 7760 (5.5); B.A.C. 7759 (5.4); Fl. 28 (5.4); ρ (5.4); Fl. 31 (5.3); B.A.C. 7961 (5.4); B.A.C. 8039 (5.4); B.A.C. 8106 (5.5).

21. CETUS.

Fr. La Baleine; Germ. Der Wallfisch.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constell	ation	 	I 45	- I 2
A	/ Preceding		 	23 50	
Approximate Boundaries,	Following	•	 	3 20	
	North		 		+ 10
1900.	South		 		-25

Cetus is a very large constellation as regards its area, but not one of any great interest either from a naked-eye or telescopic point of view. The chief stars are:—

	Mag.	10125		Mag.
β	 2.1	γ	 	 3.6
a (Menkar)	 2.7	θ	 	 3.8
·	 3.6	5	 	 3.8
η	 3.6	υ	 	 3.8
τ	 3.6			

Allusion must here be made to the celebrated variable o Ceti, commonly called Mira, because at its maximum it generally reaches the 3rd or even the 2nd mag.

Besides the foregoing there are 27 stars between 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
	17.34			O STATE OF S	h. m.	0 ,	
1		2	8358	4252	23 57.6	- 18 o	4.6 : 4.3
2		3	8361	4255	23 58.4	-11 11	5.2
3		6	21	17	0 5.2	- 16 8	4.9 : 4.6
4			••••	21	0 6.1	— 18 37	5.2
5		7	33	30	0 8.5	- 10 36	4.6 : 4.3
6	ı	8	62	45	0 13.3	- 9 29	3.6 : 3.7
7			115	68	0 24.4	- 24 27	5.2
8	β	16	196	103	0 37.6	- 18 39	2.1 : 2.4
9	ϕ^1	17	200	109	0 38.1	- 11 16	4'9
10			203	111	0 38.8	- 22 40	5.5

No.	Letter.	Flam- steed.	B,A,C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
			To be seen		h. m.	0 ,	
11		20	242	138	0 46.9	— 1 48	5.0 : 2.5
12	η	31	332	183	I 2.6	- 10 49	3.6 : 3.2
13		37	372	203	1 8.4	- 8 34	5.0 : 2.5
14	θ	45	420	220	1 18.0	- 8 48	3.8 : 3.4
15		48	449	236	1 23.8	- 22 15	2.1
16	7	52	536	271	ı 38·5	- 16 34	3.6 : 3.1
17	x	53	559	282	I 43.7	- 11 17	4.8 : 4.7
18	5	55	565	286	1 45.5	- 10 56	3.8 : 3.2
19		56	594	302	1 51.0	-23 7	5.3
20	υ	59	618	315	1 54.3	-21 40	3.8 : 3.6
21			627	322	1 55.9	- 30 35	5.3
22	ξ ¹	65	684	352	2 6.6	+ 8 17	4.4 : 4.5
23	0	68	720	370	2 13.3	- 3 31	Var.
24	P	72	754	385	2 20.2	- 12 50	4.9
25	₹2	73	760	389	2 21.8	+ 7 56	4.4 : 4.7
26	σ	76	781	400	2 26.4	- 15 46	4.7
27			790	404	2 28.6	- 28 46	4.8
28	ν	78	794	409	2 29.6	+ 5 5	4.9 : 4.9
29	δ	82	811	418	2 33.3	- 0 11	4·1 : 4·2
30	•	83	815	420	2 33.8	- 12 23	5.0 : 4.2
31	7	86	837	433	2 37.1	+ 2 44	3.6 : 3.4
32	π	89	847	4.36	2 38.4	- 14 22	4.3 : 4.0
33	μ	87	845	437	2 38.5	+ 9 36	4.4 : 4.5
34	λ	91	929	477	2 53°3	+ 8 26	4.6 : 4.9
35	a	92	949	482	2 56.0	+ 3 37	2.7 : 2.4
36		94	994	510	3 6.6	— 1 39	5.0 : 2.3
37	κ^1	96	1028	529	3 13.1	+ 2 56	5.0 : 2.1

H.P. 29 (5.4); B.A.C. 35 (5.4); Fl. 13 (5.3); H.P. 124 (5.5); ϕ^2 (5.3); ϕ^3 (5.6); ϕ^4 (5.8); Fl. 28 (5.4); Fl. 46 (5.3); Fl. 49 (5.5); Fl. 50 (5.5); H.P. 270 (5.4); Fl. 60 (5.4); Fl. 67 (5.5); H.P. 377 (5.5); H.P. 386 (5.5); B.A.C. 776 (5.5); Fl. 97 (5.5).

22. CHAMÆLEON.

Fr. Caméléon; Germ. Das Chamäleon.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	10 40	-78
	/ Preceding	 	8 0	
Approximate	Following	 	13 0	
Boundaries,	North	 		-73
1900.	South	 		-83

Chamæleon is a small and unimportant constellation not far from the South Pole which has no star brighter than a of mag. 4·2. It contains however 6 other stars nearly as bright, that is to say between $4\cdot4-5\frac{1}{2}$ mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
E VA					h. m.	0 ,	
I	a		2849	A 4	8 21.6	-76 32	4.5
2	θ		2870	A 5	8 24.2	-77 6	4.7
3	5		3334	A 14	9 37.4	- 80 24	5.5
4	γ		3660	A 23	10 34.1	— 77 59	4.4
5	δ^2		3724	A 26	10 44.6	-79 54	4.9
NO							
6	€	•••	4048	A 37	11 53.7	—77 33	4.9
7	β		4131	A 40	12 11.3	- 78 39	4.6

23. CIRCINUS.

Fr. Le Compas; Germ. Der Zirkel.

			R.A. h. m.	Decl.
Meridional Cen	tre of Constellation		 14 50	-63
	Preceding		 14 10	
Approximate Boundaries,	Following		 15 20	
	North	•••		-55
1900.	South			-68

Circinus is a very small constellation with one fairly bright star a of mag. 3.5, and 3 others between $4-5\frac{1}{2}$ mags.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent, Reference.			Magnitude. Harv. : Oxford.
	and a				h. m.	0 ,	
I	a,	***	4835	A 17	14 32.8	-64 27	3°5
2	€ .		5007	A 43	15 7.5	-63 9	5.2
3	β		5011	A 44	15 8.1	- 58 21	4.7
4	γ		5044	A 47	15 13.8	- 58 53	5.5

Lac. 6119 (5.9); θ (5.8); η (5.9); δ (5.6).

24. COLUMBA NOACHI.

Fr. La Colombe; Germ. Die Taube.

				R.A.	Decl.
		THE ST		h. m.	0
Meridional Cent	tre of Constella	tion	 	5 40	-34
Approximate			 	5 0	
	Following		 	6 20	
Boundaries,	North		 		-27
1900.	South		 		-43

Columba is a small constellation to the south of Lepus, partly visible in England, and possessing the following stars of importance:—

together with 9 between 4-5½ mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.			Magnitude, Harv. : Oxford.
					h. m.	0 /	
1	0		1650	A 11	5 13.9	-35 I	5.1
2	•		1739	1101	5 27.0	- 35 34	3.8
3			1787	1042	5 33'1	- 28 46	5.2
4	α		1802	1048	5 35.3	- 34 8	2.7
5	μ		1841		5 41.5	- 32 21	5.4
6	β		1878	1088	5 46.7	- 35 48	2*9
7	λ		1891	A 57	5 48.8	-33 49	2.5
8	E		1906	A 61	5 51.3	-37 8	5.4
9	γ		1922	1110	5 53'3	- 35 17	4.1
10	•		1946	1125	5 58.4	- 26 17	5.0

nitude. : Oxford.		Decl. 1880.	R.A. 1880.	Harvard or Argent. Reference.	B.A.C.	Flam- steed.	Letter.	No.
	-	0 ,	h. m.	7	Marie Sale	HILL		
	5.3	- 37 14	6 3.4	A 79	1982		θ	11
1133	4.8	- 35 6	6 12.3	A 84	2034		K	12
		19499			S S S S		118 38	-032

Lac. 1868 (5.9); Lac. 1895 (5.8); Lac. 1941 (5.7); Lac. 1936 (5.9); Lac. 1964 (5.7); Lac. 2067 (5.8); σ (5.6); Lac. 2124 (5.8); Lac. 2130 (5.9); π^2 (5.8); Lac. 2217 (5.8).

25. COMA BERENICES.

Fr. La Chevelure de Bérénice; Germ. Das Haupthaar der Berenice.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	12 40	+ 27
	/ Preceding	 	11 50	
Approximate	Following	 	13 30	
Boundaries,	North	 		+ 32
1900.	South	 		+14

Coma Berenices is a small constellation exhibiting a considerable number of medium-sized stars distributed over its whole area at something approaching equi-distant intervals. The brightest is β of mag. 4.4, but besides that there are 17 stars as bright as or brighter than 5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. Decl. 1880.		Magnitude. Harv. or Arg.: Oxford.
				E A STEEL	h. m.	0 /	
1		. 6	4125	2079	12 9.9	+ 15 34	2.1 : 2.1
2		7	4127	2081	12 10.3	+ 24 37	5.2 : 5.4
3		11	4156	2094	12 14 7	+ 18 27	4.9 : 4.7
4		12	4169	2098	12 16.5	+ 26 31	4.8 : 4.6
5		13	4181	2103	12 18.3	+ 26 46	5.1 : 5.5
6		14	4191	2109	12 20.4	+ 27 54	5.1 : 2.1
7	7	15	4195	2110	12 21.0	+ 28 54	4.7 : 4.5
8		16	4196	2111	12 21.0	+ 27 29	5.1 : 5.4
9		17	4207	2117	12 22.9	+ 26 35	5.3 : 5.1
10		23	4240	2136	12 28.9	+ 23 17	4.9 : 4.9

No.	Letter.	Flam- steed.	B,A,C,	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m,	0 ,	1781-2481/2018
11		24	4242	2137	12 29'1	+19 2	5.0 : 4.8
12		31	4315	2181	12 45.9	+ 28 12	5.0 : 2.1
13		35	4328	2184	12 47.4	+21 54	5.1 : 2.0
14		36	4351	2201	12 53.0	+ 18 4	5.0 : 5.3
15		37	4360	2 204	12 54.5	+31 26	5.1 : 5.0
16		41	4390	2218	13 1'4	+ 28 16	4.9 : 50
17	a	42	4406	2226-7	13 4'2	+ 18 10	4.4 \ \ 5.1 \ 4.4
18	β	43	4421	2232	13 6.3	+ 28 29	4.4 : 4.5

Fl. 18 (5.5); Fl. 21 (5.5); Fl. 26 (5.4); Fl. 27 (5.3).

26. CORONA AUSTRALIS.

Fr. La Couronne Australe; Germ. Die Südliche Krone.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	18 30	-41
Approximate	/ Preceding	 	17 55	
	Following	 	19 5	
Boundaries,	North	 		-36
1900.	South	 		- 45

Corona Australis is sometimes designated by foreign astronomers Corona Austrinus, but Australis is undoubtedly to be preferred. The brightest star is β of mag. 4·1: next follows a, which is 4·2. Six of the naked-eye stars, including the 2 just mentioned, near the following border are disposed in a curved line which Gore speaks of as a good example of a "star stream." Altogether there are 8 stars above the magnitude of $5\frac{1}{2}$.

No.	Letter.	Flam- steed,	B, A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl., 1880.	Magnitude. Harv. : Oxford.
	7		ELT CORTE		h. m.	0 /	
1	θ		6296	A 15	18 25.0	- 42 24	5.1
2			6378	A 24	18 39.3	-40 3I	5.2
3	E		6458	A 34	18 50.6	- 37 15	5.2
4	5		6484	A 39	18 54.6	-42 15	5.5
5	γ		6511	A 41	18 58.3	-37 14	4.6

No.	Letter.	Flam- steed.	B. A. C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
6 7 8	δ α β		6523 6535 6541	A 43 A 44 A 46	h. m. 14 0.0 19 1.3 19 1.8	0 ' -40 4I -38 5 -39 32	5°0 4°1 4°1

Lac. 7550 (5.6); Lac. 7621 (5.9); Lac. 7671 (5.6); Lac. 7680 (5.7); Lac. 7748 (5.6); κ (5.4); Lac. 7790 (5.8); λ (5.4); Lac. 7829 (5 $\frac{3}{4}$); η^1 (5.7); Lac. 7909 (5.8); Lac. 7916 (5.7).

27. CORONA BOREALIS.

Fr. La Couronne Boréale; Germ. Die Nördliche Krone.

	THE WEST		R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellat	ion	 15 40	+ 30
	Preceding .		 15 10	
Approximate Preceding 15 10 Following 16 20 North				
AND THE PARTY OF T	North .			+40
1900.	South .			+ 2 I

Corona Borealis is a constellation respecting which Webb remarked that it resembles "more than usual the object whose name it bears." The brightest stars are the following:—

α 2·4
β 3·8

and there are 13 other stars between 4-5.2 mags.

No.	Letter.	Flam- steed.	B, A, C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
	200				h. m.	0 ,	
1	η	2	5075	2559	15 18.2	+ 30 43	5.0 : 2.0
2	β	3	5098	2572	15 22.9	+ 29 31	3.8 : 3.8
3	θ	4	5131	2588	15 28.1	+ 31 46	4'3 : 4'2
4	a	5	5143	2594	15 29.6	+ 27 7	2.4 : 2.2
5	5	7	5178	2614-5	15 34.9	+ 37 2	$4.8 {6.1 \atop 5.2} 4.7$
6	γ.	8	5192	2625	15 37.7	+ 26 41	4.5 : 3.0
7	δ	10	5244	2643	15 44.6	+ 26 26	4.6 : 4.9
8	к	II	5259	2652	15 46.7	+ 36 2	4.7 : 5.0
9	€	13	5302	2673	15 52.6	+ 27 14	4.1 : 4.5
10	ρ	15	5319	2685	15 56.5	+ 33 40	5.3 : 2.1

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. Decl. 1880.		Magnitude. Harv.: Oxford.
150					h. m.	0 /	
11	1	14	5321	2686	15 56.7	+ 30 11	5.1 : 2.0
12	7	16	5385	2710	16 4.6	+ 36 47	5.5 : 2.1
13	\$	19	5473	2750	16 17.4	+31 10	4.5 : 4.6
14	ν¹	20	5479	2751	16 17.8	+35 5	5.1 : 5.1
15	ν^2	21	5480	2752	16 18.0	+33 59	5.0 : 2,1

 λ (5.6); μ (5.4); σ (5.7); π (5.6); σ (5.3); ν (5.8).

28. CORVUS.

Fr. Le Corbeau; Germ. Der Rabe.

			R.A.	Decl.
			h. m.	0
Meridional Cent	ere of Constellation	 	12 30	-18
	Preceding	 	11 55	
Approximate	Following	 	13 0	
Boundaries,	North	 		-11
1900.	South	 		-25
The state of the second	, south	 		-

Corvus, though a small constellation, contains an unusual proportion of bright stars, several of which are suspected of variability. The principal stars are:—

		Mag.	-			Mag.
γ.	 	 Mag. 2.8		€	 	 3.1
β.	 	 2.8		δ	 	 3.1

These form a trapezium. The star lettered a is now only of mag. 4·3, which seems remarkable, and it is difficult to believe that Bayer could have allotted that letter to that star if it had been in 1603 as small as it now is. Besides the foregoing stars there are 3 others as bright as 5·2 mag.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford. or Arg. :
					h. m	0 /	
1	a	I	4090	2060	12 2.2	-24 3	4.3
2	•	2	4097	2063	12 4'0	- 21 57	3.1
3	1	3	4101	2066	12 4.9	- 22 56	5.5
4	1 7	4	4124	2078	12 96	- 16 53	2.8
5	δ	7	4211	2120	12 23.7	- 15 51	3.1

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
DI SEE					h. m.	0 ,	
6	η	8	4226	2128	12 25.9	- I5 32	4.4
7	β	9	4234	2134	12 28.1	- 22 44	2.8

ζ (5·5); B.A.C. 4157 (5·4); H.P. 2154 (5·3).

29. CRATER.

Fr. La Coupe; Germ. Der Becher.

			R.A.	Decl.
			h. m.	0
Meridional Cent	ere of Constellation	•••	 II 20	-15
A	Preceding		 10 45	
Approximate	Following		 12 0	
Boundaries,	North			- 5
1900.	South			-23

Crater is by some catalogue-makers treated as part of Hydra, but its individuality as a separate asterism is now admitted by the best authorities. The following are its principal stars:-

and there are 13 stars ranging between 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg.: Oxford.
					h. m.	0 ,	
1	b^3	6	3733	1905	10 47.6	- 19 30	5.5
2	a	7	3766	1918	10 53.9	- 17 40	4.1
3	χ1	9	3793	1932	10 59.6	- 26 39	5.5
4	β	11	3826	1946	11 5.8	- 22 10	4*4
5	δ	12	3859	1963	11 13.3	— 14 8	3.9
6	λ	13	3874	1968	11 17.4	-18 7	5.0
7	€	14	3881	1971	11 18.6	- 10 12	5.0
8	γ	15	3883	1973	11 18.9	-17 1	4.5
9		17	3922	1991	11 26.3	— 28 36	5.0
10		19	3928	1994	11 27.1	- 31 12	3.8

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880,	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 ,	
11	θ	21	3943	2002	11 30.6	- 9 8	4.7
12	5	27	3978	2016	11 38.7	-17 41	4'9
13		28	4015	2035	11 46 8	- 33 14	4°2
14	η	30	4035	2044	11 49.9	- 16 29	5.0
15		31	4053	2052	11 54.7	- 18 59	5.1
15	***	31	4053	2052	11 54.7	— 18 59	5.1

 κ (5.8); ι (5.6); b^1 (5.4); Fl. 10 (5.4); Fl. 18 (5.4); Fl. 26 (5.4); H.P. 2050 (5.5).

30. CRUX.

Fr. La Croix du Sud; Germ. Das Kreuz.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	 	12 20	-60
Approximate	Preceding	 	11 45	
Boundaries,	Following	 	12 50	
The second secon	North	 		-56
1900.	South	 		-64

The Southern Cross, as it is generally designated, is a constellation small in size, but always spoken of with much enthusiasm by those who have seen it. The chief stars are:—

		Mag.			Mag.
a	 	 1.3	γ	 	2.0
B	 	 1.7	δ	 	3.4

These form the cross. There are also 5 stars ranging between mags. 4—5·2.

No.	Letter.	Flam- steed.	B, A.C.	Harvard or Argent. Reference.	R. A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 /	
I	θ1		4061	A 6	11 56.9	-62 38	4.7
2	θ^2		4067	A 7	11 28.1	-62 29	5.3
3	η		4078	A 10	12 0.6	-63 57	4.7
4	δ		4120	A 18	12 8.8	-58 5	3.4
5	5		4133	A 19	12 11.9	-63 20	4.6

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
			-071-21-		h. m.	0 ,	
6	€		4158	A 22	12 14.9	-59 44	4.0
7	a		4187	A 26	12 19.9	-62 26	1.3
8	γ		4215	A 34	12 24.5	- 56 26	2.0
9			4284	A 45	12 39.5	- 55 49	5.4
10	β		4289	A 46	12 40.7	-59 ²	1.4
11			4325,7	A 52-3	12 47.5	- 56 31	4.1

Brisb. 4073 (5·9); ι (5·7); λ (5·6).

31. CYGNUS.

Fr. Le Cygne; Germ. Der Schwan.

		1000		R.A.	Decl.
	181			h. m.	0
Meridional Cen			 ***	20 30	+ 40
A	/ Preceding		 	19 10	
Approximate Boundaries,	Following		 	21 50	
	North		 		+60
1900.	South		 		+ 29

Cygnus is a large and important constellation from whatever standpoint it may be regarded. Not only are the naked-eye stars very numerous, but its telescopic objects of interest, especially its red stars, are also numerous and interesting. This seems partly due to the fact that a rich part of the "Milky Way" occupies a large portion of the constellation. Its important stars are:—

		Mag.	1			Mag.
a (Deneb)	2	1.5		8	 	 3.7
γ		2.3	1 53	01	 	 3.8
£		2.7	1 83	к	 	 3.9
δ		3.0		ı	 	 3.9
β (Albireo)	•••	3.1		τ	 	 3.9
ζ	•••	3.5				

and there are no fewer than 50 stars between 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
100							or Arg.
					h. m.	0 /	210 . 219
1	к	1	6623	3316	19 14.3	+53 9	3.9 : 3.8
2		2	6648	3342	19 19.4	+ 29 33	4.9 : 2.1
3		4	6667	3352	19 21.8	+ 36 5	2.1 : 2.1
4	βι	6	6690	3362	19 25.9	+ 27 43	3.1 : 3.0
5	β^2	•••	6691	3363	19 25.9	+ 27 43	5.5.: 4.8
6		10	6697	3365	19 26.7	+ 51 28	3.9 : 4.0
7		8	6698	3366	19 27.4	+ 34 12	4.8 : 4.7
8			6718	3382	10 30.8	+42 8	5.3 : 2.4
9			6731	3392	19 32.9	+ 44 26	5.3 : 2.4
10	θ	13	67.34	3393	19 33.2	+ 49 57	4.6 : 4.9
II	φ.	12	6740	3397	19 34.6	+ 29 53	4.9 : 2.1
12			6754	3407	19 37.2	+ 45 14	5.1 : 5.3
13		15	6771	3417	19 40.0	+ 37 4	5.0 : 2.4
14	δ	18	6779	3419	19 41.2	+44 50	3.0 : 2.8
15	x	17	6784	3420	19 41.6	+ 33 27	5.0 : 2.3
16	d	20	6824	3440	19 47.6	+ 52 41	5.0 : 2.3
17	:	23	6847	3455	19 50.8	+ 57 12	2.1 : 2.3
18		22	6849	3458	19 51.6	+ 38 10	4.7 : 5.1
19	η	21	6851	3460	19 51.8	+ 34 46	4.0 : 4.1
20	ψ.	24	6856	3463	19 52.5	+ 52 7	4.8 : 4.8
21		25	6875	3479	19 55.5	+ 36 43	5.5 : 2.2
22	e	26	6895	3486	19 58.0	+ 49 46	5.2 : 5.3
23	b^2	28	6937	3513	20 5.0	+ 36 29	4.8 : 5.0
24	: 01a	30	6962	3527	20 9.5	+ 46 7	4.9 : 4.7
25	; o1b	31	6965	3528	20 9.9	+ 46 23	3.8 : 4.5
26	b3	29	6967	3529	20 10.1	+ 36 27	5.0 : 2.0
27		33	6976	3532	20 10.6	+ 56 12	4.4 : 4.2
28		32	6983	3541	20 11.8	+ 47 21	4'1 : 4'5
29	P	34	6990	3547	20 13.4	+ 37 39	4.9
30		35	6998	3551	20 14'0	+ 34 37	5.5 : 2.3
31	Y	37	7022	3564	20 17.9	+ 39 52	2.3 : 2.2
32		39	7029	3569	20 19.1	+ 31 48	4.6 : 4.8
33		41	7067	3583	20 24.5	+ 29 58	4·1 : 4·3

	1						
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent.	R.A.	Decl.	Magnitude.
	No.	steed,		Reference.	1880.	1880.	or Arg. : Oxford.
		1129			h. m.	0 ,	
34	ω^2	45	7085	3587	20 26.3	+ 48 33	5.0 : 2.0
35		47	7103	3599	20 29.3	+ 34 51	4.8 : 5.0
						ALL SERVICE	
36	a	50	7171	3631	20 37.3	+ 44 51	1.2 : 1.3
37		52	7194	3643	20 40.7	+ 30 17	4'3 : 4'5
38	•	53	7204	3648	20 41.4	+ 33 31	2.4
39	T	•••	•••	3654	20 42.4	+ 33 56	5.5
40	λ	54	7213	3655	20 42.7	+ 36 3	4.6 : 4.9
41		55	7233	3662	20 44'9	+ 45 40	5.0 : 5.4
42		56	7241	3665	20 45.9	+ 43 36	5.0 : 2.5
43		57	7253	3673	20 49'0	+ 43 56	4.6 : 4.8
44	ν	58	7277	3687	20 52.7	+40 42	4'I : 4'2
45	fi	59	7301	3701	20 55.7	+47 3	4.6 : 4.7
1							
46		60	7306	3705	20 57.0	+ 45 41	5.3 : 2.3
47	. 8	62	7333	3716	21 0.6	+ 43 27	3.4 : 4.0
48		61	7336-7	3717-8	21 1.2	+ 38 10	2.1 : 2.0
49	f^2	63	7345	3721	21 2.2	+47 10	2.1 : 2.3
50	5	64	7368	3732	21 7.8	+ 29 44	3.2 : 3.1
51	τ	65	7385	3741	21 10.0	+ 37 32	3.0 : 3.6
52	σ	67	7398	3745	21 12.7	$+37 3^{2} +38 53$	4'3 : 4'5
53	v	66	7399	3747	21 13.0	+ 34 24	4.4 : 4.3
54	A	68	7402	3750	22 14.1	+ 43 26	50: 50
55		70	7462	3784	21 22.4	+ 36 36	5.1 : 2.1
33			74	37.74		1 ,35 30	
56	ρ	7.3	7503	3807	21 29'5	+45 4	4.5 : 4.1
57		72	7505	3808	21 29.9	+ 38 0	5.0 : 2.3
58		74	7521	3814	21 32.1	+39 52	5.1 : 2.5
59	π^1	80	7560	3833	21 37.8	+ 50 38	4.9 : 4.9
60	μ	78	7568	3840	21 38.8	+ 28 12	4'4 : 4'5
6.	_2	0-	200	28-6	21 (2)	1.0	
61	π^2	81	7598	3856	21 42.4	+ 48 45	4.4 : 4.8

Fl. 9 (5·4); Fl. 14 (5·3); c (5·5); Fl. 19 (5·5); B.A.C. 6817 (5·5); H.P. 3471 (5·4); H.P. 3497 (5·5); b^1 (5·5); B.A.C. 6986 (5·5); Fl. 40 (5·5); ω^1 (5·6); ω^3 (5·6); B.A.C. 7174 (5·5); Fl. 51 (5·4); H.P. 3657 (5·5); B.A.C. 7294 (5·5); H.P. 3724 (5·5); B.A.C. 7111 (5·4); B.A.C. 7455 (5·5); H.P. 3786 (5·3); g (5·3); Fl. 75 (5·3); Fl. 77 (5·3); B.A.C. 7565 (5·5); Fl. 79 (5·5); B.A.C. 7631 (5·5).

32. DELPHINUS.

Fr. Le Dauphin; Germ. Der Delphin.

			R.A.	Decl.
			h. m.	01
Meridional Cen	20 35	+ 12		
Approximate	/ Preceding	 	20 15	
Boundaries,	Following	 	21 10	
	North:	 		+ 20
1900.	South	 	***	+ 3

Delphinus is a small and compact constellation of no great interest to the naked-eye observer. The principal star is β of mag. 3.7, and there are 7 stars ranging from 4—5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880,	Decl. 1880.	Magnitude. Harv. : Oxford.
1		17.00			h. m.	0 ,	
I	€	2	7088	3592	20 27.5	+ 10 54	4.1 : 3.6
2	η	3	7094	3597	20 28.3	+ 12 38	5.3 : 2.3
3	5	4	7107	3600	20 29.7	+ 14 16	4.7 : 4.8
4	β	6	7121	3605	20 31.9	+14 11	3.7 : 3.5
5	к	7	7141	3620	20 33.3	+ 9 40	2.1 : 2.1
6	a	9	7149	3624	20 34.1	+ 15 29	4.0 : 3.0
7	δ	11	7173	3635	20 37.9	+ 14 39	4.6 : 4.6
8	γ^1	12	7199	3645	20 40'1	+ 15 42	5.6 1.0 4.0
9	γ2		7200	3646	20 40°1	+ 15 42	4.6}4.2{5.0

ι (5·3); Fl. 13 (5·5); Fl. 17 (5·4); Fl. 16 (5·4).

33. DORADO.

Fr. Dorade; Germ. Dorado.

The state of the s			R.A. h. m.	Decl.
Meridional Cen	5 0	-60		
	Preceding	 	3 45	
Approximate	Following	 	6 30	
Boundaries,	North	 •••		-49
1900.	South	 		-70

The chief stars in this constellation are:-

			Mag.
α	 	 	3.1
B	 	 	3.9

and there are 7 stars ranging from 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
	10.5				h. m.	0 ,	
1	γ		1331	A 3	4 12.9	-5I 47	4'4
2	a		1438	A 8	4 31.3	- 55 18	3.1
3	5		1600	A 20	5 3.4	- 57 38	4.8
4	θ		1659	A 22	5 13.9	-67 19	2.I
5	β		1791	A 29	5 32.6	-62 34	3.9
Section 1	PER						
6	δ	•••	1868	A 33	5 44.5	-65 46	4.2
7	€		1905	A 34	5 50.0	-66 55	4.9
8			, 1926	A 36	5 53'2	-63 7	5.1
9	ν		2025	A 39	6 9.5	- 68 49	5.3
10	η^2		2031	A 40	6 11.0	— 65 33	5.2

 κ (5.6); Lac. 1772 (5.7); λ (5.6); Lac. 1949 (5.9); π^2 (5.9).

34. DRACO.

Fr. Le Dragon; Germ. Der Drache.

			R.	A.	Deel.
			h.	m.	0
Meridional Cen	tre of Constellation	 	16	0	+60
1 40 25 Ob 5	/ Preceding	 	9	0	
Approximate	Following	 	20	20	
Boundaries,	North	 			+82
1900.	South	 			+ 50

Draco is one of the most difficult constellations in the heavens to deal with from a topographical point of view, because of its great length and of its being always within the circle of perpetual apparition to an observer in British latitudes. It extends through nearly 12 hours of R.A., and the study of its constituent stars is rendered doubly difficult to an observer in England by reason of the fact that it passes the meridian in the zenith. Its chief stars are:—

		Mag.		1				Mag.
7	 	 2.4			a			 3.6
η	 	 2.8			X			 3.7
β	 	 3.0			к			 3.8
δ	 	 3.2			ξ			 3.9
5	 	 3.3	***	1,24.40	•	w.	- 2	 3.9
L	 	 3.4	200	111		10.5		

There are no fewer than 41 stars ranging from 4-5.2 mags.

	A STATE OF						
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
To the same					h. m.	0 /	
1			3199	1695	9 19.8	+81 51	4.6 : 4.4
2			3593	1851	10 24.9	+ 76 20	5.1 : 4.9
3	: λ	1	39.14	1988	11 24.3	+70 0	4.1 : 3.8
4			4112	2070	12 6.6	+78 17	5.1 : 5.1
5	к	5	4239	2135	12 28.4	+ 70 27	3.8 : 3.7
6		6	4246	2141	12 29.7	+ 70 42	5.1
7	i	10	4646	2356	13 47'9	+ 65 19	4.7 : 4.8
8	a	11	4696	2381	14 1.1	+ 64 57	3.6 : 3.6
9			4949	2510	14 55.7	+ 66 25	4.8
10			4992	2529	15 2.9	+55 I	5.2 : 5.3
11		12	5097	2569	15 21.8	+ 59 23	3.4 : 3.5
12	100			2644	15 44.8	+62 58	5.5
13			5 ² 49 53 ¹ 3	2680	15 54.9	+ 55 5	5.0 : 2.5
14		13	5348	2696	15 59.6	+ 58 53	4.5 : 3.0
15	η	14	5512	2766	16 22.4	+61 47	2.8 : 2.8
- 1996	6 11	1	AND THE		16 28.2	Marie San	5.0 : 4.9
16	A	15	5545	2781			2.5 : 2.5 2.0 : 4.6
17		17	5575	2794-5 2813	16 33.4	+ 53 10 + 64 49	5.0 : 2.0
18	9	18	5628	2820	16 43.0	+ 57 0	4.9 : 4.9
19	h1		5643		16 55.4	+ 65 19	4.7 : 4.9
20	11-	19	5740	2843			
2 I	μ	2 I	5785	2865	17 2.8	+ 54 38	5.5 : 2.0
22	5	22	5823	2878	17 8.4	+65 52	3.3 : 3.3
23	β	23	5937	2937	17 27.7	+ 52 23	3.0 : 3.0
24	ν1 .	24	5950	2945	17 29.8	+ 55 16	4.8 : 4.7
25	ν^2	25	5951	2946	17 29.9	+ 55 15	THE X PROPERTY.
26	ω	28	6006	2964	17 37.7	+ 68 49	4.9 : 4.8
27	ψ^1	31	6047	2985	17 41.1	+72 12	4.2 : 4.8
28		30	6052	2989	17 46.2	+ 50 50	5.5 : 2.5
29	E	32	6079	3003	17 51.5	+ 56 54	3.9 : 3.9
30	γ	33	6091	3009	17 53.8	+ 51 30	2.4 : 2.4
31		35	6114	3019	17 54.8	+ 76 59	5.1 : 5.1
32		40-1	6206,8	3071-2	18 9.0	+ 79 58	5 2 6.2 : 6.0
33		36	6224	3081	18 13.2	+ 64 21	5.0 : 2.0
34			6255	3106	18 18.5	+49 4	2.1 : 2.1
35	b	39	6289	3116	18 22.2	+ 58 44	4.8 : 4.8

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
		THE WE			h. m.	0 ,	
36	φ	43	6297	3120	18 22.5	+71 16	4.5 : 4.5
37	X	44	6302	3122	18 23.2	+ 72 41	3.7 : 3.9
38	• • • •	42	6316	3126	18 25.6	+65 29	5.0 : 2.1
39	d	45	6348	3136	18 30.2	+ 56 57	4.8 : 4.9
40	C	46	6395	3166	18 40.3	+ 55 25	5.3 : 2.3
41	0	47	6463	3206	18 49.4	+ 59 14	4.6 : 4.7
42			6470	3214	18 50.3	+ 50 34	4.9 : 2.1
43	υ	52	6510	3242	18 55.9	+71 8	4.8 : 5.0
44		53	6583	3289	19 9.4	+ 56 39	2.5 : 2.5
45	δ	57	6612	3307	19 12.5	+67 27	3.5 : 3.0
46		59	6625	3313	19 13.5	+ 76 21	4.9 : 5.2
47	. 7	60	6650	3328	19 17.9	+73 8	4.5 : 4.6
48	π	58	6662	3345	19 20.1	+65 29	4.6 : 4.8
49	σ	61	6735	3389	19 32.6	+ 69 27	4.7 : 4.8
50	€	63	6836	3447	19 48.6	+ 69 58	3.9 : 3.7
51	ρ	67	6926	3506	20 2.3	+ 67 32	4.6 : 4.5
52		73	7156	3614	20 33.1	+ 74 33	5.1 : 5.4

Fl. 2 (5·5); Fl. 3 (5·5); Fl. 4 (5·3); Fl. 8 (5·3); B.A.C. 5404 (5·4); B.A.C. 5459 (5·4); B.A.C. 5514 (5·4); B.A.C. 5599 (5·5); B.A.C. 5840 (5·5); f (5·3); Fl. 26 (5·3); B.A.C. 6350 (5·4); H.P. 3153 (5·5); B.A.C. 6469 (5·4); H.P. 3249 (5·4); Fl. 51 (5·4); Fl. 54 (5·3); e (5·4); B.A.C. 7299 (5·4); Fl. 78 (5·4).

35. EQUULEUS.

Fr. Le Petit Cheval; Germ. Das Füllen.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constella	tion		 21 10	+ 6
	Preceding			 20 45	
Approximate	Following .		•••	 21 30	
Boundaries,	North .				+11
1900.	South .				+ 1

Equuleus is a small constellation of which the brightest star is a, of mag. $4\cdot 1$. There are 3 other stars between that and mag. $5\cdot 2$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	P.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
	100			29.3	h. m.	0 ,	
1	7	5	7350	3726	21 4'5	+ 9 39	4.8 : 4.4
2	δ	7	7372	3735	21 8.7	+ 9 31	4.6 : 4.5
3	a	8	7380	3739	21 9.8	+ 4 45	4.1 : 3.9
4	β	10	7421	3765	21 16.9	+ 6 18	4.9 : 2.0

Fl. 1 (5.4).

36. ERIDANUS.

Fr. L'Eridan; Germ. Der Fluss Eridanus.

			R.A	Decl.
			h. m.	0
Meridional Cent	tre of Constellation	on	 3 50	-30
Approximate Boundaries, 1900.	Preceding		 I 30	
	Following		 5 0	
	North			- 0
	South			-57

Eridanus is a very long straggling constellation, of which a large part is invisible in England, reaching as it does from the Equator to 60° of S. Declination; and it is the southern part of the constellation which contains the brightest stars. The chief stars are:—

		Mag.			Mag.
a (Achernar)		1.0	€	 	3.7
θ		2.6	δ	 	3.7
β	•••	2.9	12	 	3.8
γ		3.0	υ 7	 •••	3.8
ν4		3.3	τ4	 	3.8
φ		3.5	53	 	3.9

There are also 44 stars ranging from 4-5.2 mags.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
				The Market	h. m.	0 /	
1	a		507	A 2	1 33.3	- 57 5I	1.0
2	q^2	•••	550	A 6	1 41.5	- 54 8	5.4
3	X		596	A 7	1 51.3	- 52 12	3.9
4	φ		717	A 14	2 12'0	- 5 ² 4	3.2
5	к		763	A 16	2 22.6	-48 14	4.5

COLUMN TO SERVICE		FLORE		400			
No.	Letter.	Flam-, steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
		-			h. m.	0 ,	
6	:		828	A 18	. 2 35.2	-43 24	5.0
7	: 4		832	A 19	2 35.9	-40 22	4.2
8	: 71	1	856	438	2 39.5	-19 5	4.7
9	: 72	2 .	887	453	2 45.6	- 21 30	4.8
10			•••	463	2 50.6	- 4 12	5.5 ; 2.5
II	η	3	910	464	2 50.6	- 9 23	4.0 : 3.9
12				474	2 52.7	- 3 16	5.0 : 5.4
13	θ		937	A 48	2 53.7	- 40 47	2.6
14	73	11	954	487	2 57.1	-24 6	4'1
15		12	997	512	3 7.0	- 29 28	3.8
16	5	7.2			3 10.0	- 9 16	4.8 : 4.8
17		13	1013	519	3 13.1	- 22 57	5.0
18	···	16	1037	530	3 14.2	-22 12	3.8.
19				533 A 82	3 15.1	-43 3 ²	4'4
20	***	17	1044	571	3 24.7	45 5 29	4.8 : 4.7
-		5741					
21	€	18	1100	576	3 27.3	- 9 52	3.7 : 3.4
22	τ ⁵	19	1104	579	3 28.5	- 22 2	4.5
23	7		1125	A 110	3 32.8	— 40 40	4.8
24	δ	23	1148	604	3 37.5	- 10 10	3.7
25			1150	605	3 37.5	- 32 19	4.8
26		24	1153	611	3 38.4	— I 33	5.1 : 2.4
27	v1		1159	A 124	3 38.4	-37 41	4.8
28	π	26	1168	619	3 40.2	- 12 29	4.4
29	76	27	1181	623	3 41.7	- 23 36	4.3
30	7	28	1191	627	3 42.5	- 24 15	4.8
31			1199	A 135	3 44'2	-3759	4.2
32	v2		1201	A 138	3 45.0	- 36 34	4.1
33		32	1216	664-5	3 48.3	- 3 19	4.8 6.5 6.4
34	7 8	33	1217	646	3 48.6	- 24 58	4.7
35	υ3		1220	A 151	3 49.1	— 35 5	5.3
36	γ	34	1234	653	3 52.4	-13 51	3.0
37	79	36	1243	660	3 54.8	-24 21	4.6
38		35	1245	662	3 55.5	- I 53	5.5 : 2.1
39	01	38	1290	701	4 6.0	- 7 9	4.1 : 4.1
40	. A	39	1303	714	4 8.7	— 10 33	4.9
7-		39	-0-0	1.7	AND THE REAL PROPERTY.	- 00	TO

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 /	
41	02	40	1309	721	4 9.7	- 7 50	4.5 : 4.5
42	υ4	41	1333	740	4 13.4	-34 6	3.3
43	υ ⁵	43	137.2	766	4 19.6	- 34 18	4.0
44		45	1403	787	4 25.7	- o 18	4.9 : 2.1
45	υ ⁶	50	1422	796	4 28.8	- 30 I	4.4
		0					
46	ν	48	1429	799	4 30.3	- 3 36	4.1 : 4.0
47	v^7	52	1433	802	4 30.0	- 30 49	3.8
48		53	1441	812	4 32.7	- I4 32	3.9
49		•••	1443	813	4 33'3	-12 21	4.9
50		54	1451	821	4 35.2	- 19 59	4.2
	,						
51	μ	57	1469	830	4 39.5	- 3 29	4.3 : 4.1
52	•••	60	1498	846	4 44.8	- 16 25	5.5
53	ω	6r	1507	854	4 47.0	- 5 39	4.5 : 4.3
54		64	1545	883	4 54.4	- 12 43	4.9
55	Ψ	65	1552	884	4 55.6	- 7 21	4.7 : 4.8
56		66	1579	906	5 0.8	- 4 49	5.5
57	β	67	1588	910	5 2:0	- 5 I5	2.9 : 2.8
58	λ	69	1597	917	5 3.4	- 8 55	4.4 : 4.3

Lac. 495 (5.6); q^1 (5.9); B.A.C. 883 (5.3); Fl. 4 (5.4); Fl. 5 (5.4); B.A.C. 940 (5.4); ρ^2 (5.4); ρ^3 (5.4); Fl. 20 (5.3); Lac. 1163 (5.8); Fl. 22 (5.4); Fl. 30 (5.4); H.P. 664 (5.5); B.A.C. 1273 (5.5); H.P. 695 (5.4); H.P. 749 (5.3); £ (5.3); H.P. 782 (5.3); Fl. 49 (5.4); σ (5.3); B.A.C. 1446 (5.5); σ (5.4); H.P. 878 (5.4); Fl. 68 (5.4).

37. FORNAX CHEMICA.

Fr. Le Fourneau Chimique; Germ. Der Chemische Ofen.

			R.A.	Decl.
			h. m.	0
Meridional Cent	re of Constellation	 	2 25	-33
	Preceding	 	I 40	
Approximate	Following	 	3 25	
Boundaries,	North	 		-24
1900.	South	 		-40

Fornax Chemica, generally known as Fornax, has for its brightest star B. A. C. 643, the mag. of which is 4.6. There are also 4 other stars between that and mag. 5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
STAR	al nus	793			h. m.	. 0 /	
1			627	A 12	1 55.9	- 30 34	5.2
2			643	A 331	1 59.1	-29 52	4.6
3	μ		688	355	2 7.6	-31 17	5.3
4	к	3	737	380	2 17.0	- 24 21	5.4
5			765	A 28	2 23.0	- 34 21	5.1
6 7			790 879	A 34	2 28·6 2 44·1	$-28 45 \\ -32 55$	4°9 4°7

Lac. 798 (5.7); Lac. 805 (5.9); Lac. 811 (5.7); Lac. 892 (5.6); Lac. 899 (5.4); Lac. 947 (5.9); Lac. 1108 (5.6).

38. GEMINI.

Fr. Les Gémeaux; Germ. Die Zwillinge.

			R.A.	Decl.
STATE OF THE PARTY OF			h. m.	0
Meridional Cen	tre of Constellatio	n	 7 0	+ 24
	/ Preceding		 5 50	
Approximate	Following		 7 50	
Boundaries,	North			+ 35
1900.	South			+11

Gemini has two well-known stars Castor and Pollux as leaders, together with several others of lesser magnitude, which help to identify the constellation. Its chief stars are:—

		Mag.	1		Mag.
B (Pollu:	x)	 1.1	η	 	 3.5
·a (Castor	r)	 1.6	λ	 	 3.6
γ		 2.0	δ	 	 3.6
μ		 3.2	к	 	 3.6
€		 3.2	θ	 	 3.7
£		 3.4			

There are also 22 stars ranging from 4—5.2 mags. Therefore, considering its comparatively small area, Gemini may be regarded as a rather bright constellation.

		y					
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg.: Oxford.
					h. 'm.	0 /	
1		1	1938	1121	5 56.8	+ 23 16	4'3 : 4'5
2	η	7	2002	1160	6 7.6	+ 22 32	3.2 : 3.6
3	μ	13	2047	1194	6 15.7	+ 22 35	3.2 : 3.4
4	ν	18	2090	1216	6 21.8	+ 20 17	4.0 : 4.3
5	γ	24	2163	1249	6 30.8	+ 16 31	2.0 : 7.I
6	1	26	2191	1260	6 35.4	+ 17 46	5.0 : 2.5
7	•	27	2194	1263	6 36.6	+ 25 15	3.5 : 3.3
8		30	2199	1266	6 37.2	+13 21	4.6 : 5.2
9	E	31	2206	1272	6 38.6	+ 13 2	3.4 : 3.8
10	d	36	2233	1293	6 44.4	+ 21 55	5.3 : 2.3
11	θ	34	2237	1295	6 44.9	+ 34 6	3.7 : 3.6
12	e	38	2255	1305	6 47'9	+ 13 20	4.8 : 4.9
13	5	43	2305	1334	6 57.0	+ 20 45	4.0 : 4.0
14			2306	1335	6 57.0	+11 7	5.5 : 2.5
15	τ	46	2340	1349	7 3.5	+ 30 26	4.6 : 4.7
16	λ	54	2398	1373	7 11.2	+ 16 45	3.6 : 3.7
17	δ	55	2410	1377	7 13.0	+ 22 12	3.6 : 3.5
18	Mag.	56	2423	1384	7 14'9	+ 20 39	5.0 : 2.1
19	A	57	2431	1387	7 16.2	+ 25 17	5.0 : 2.5
20	1	60	2442	1394	7 18.3	+ 28 2	4.0 : 4.0
		62	2464	1405	7 21.4	+ 32 1	4.2 : 4.4
21	b^1	64	2467	1409	7 21.9	+ 28 23	5.1 : 2.1
22	b^2	65	2469	1412	7 22.4	+ 28 10	5.1 : 2.0
23		68	2486	1412	7 26.8	+ 16 5	5.0 : 2.3
24	a ²	66	2485	1423-4	7 27.0	+ 32 9	1.6 2.8 1.2
			17/15/47	17	18-38-18-1	+ 27 10	4.3 : 4.4
26	υ	69	2493	1430	7 28.5	+ 34 52	4.7 : 5.0
27	0	71	2509	1436	7 31.3	+ 17 58	2.5 : 2.5
28	f	74	2519	1440	7 32.6	+ 29 10	4.1 : 4.1
29	σ	75	2540	1453	7 35.8	+ 24 41	3.6 : 3.6
30	к	77	2551	1457	7 37'2		
31	β	78	2555	1459	7 38.0	+ 28 19	5.1 : 2.3
32	g	81	2558	1463	7 39'2	+ 18 48	
33	φ	83	2617	1481	7 46.2	+ 27 5	4.9 : 5.0

Fl. 28 (5.4); Fl. 33 (5.4); w (5.3); Fl. 47 (5.5); Fl. 51 (5.4); Fl. 63 (5.3); B.A.C. 2489 (5.4); c(5.3); $\pi(5.4)$; Fl. 85 (5.3).

39. GRUS.

Fr. La Grue; Germ. Der Kranich.

			R.A. b. m.	Decl.
Meridional Cen	tre of Constellation	 	22 20	-47
Approximate	Preceding Following	 	21 20	
Boundaries,	North	 	23 30	-37
1900.	South	 		- 57

Grus, though a small constellation, contains a considerable number of important stars, the chief of which are as follows:—

		Mag.	1			Mag.
a	 	 1.9		•	 	 3.5
β	 	 2.2		ı	 	 3.9
Y	 	 3.0	1			

There are 9 stars between mags. $4-5\frac{1}{2}$. Most of the conspicuous stars of Grus, exceping a, are arranged in a gently curved line.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg.: Oxford.
					h. m.	0,	
I	γ		7613	A 18	21 46.7	-37 58	3.0
2	λ		7684	A 27	21 58.9	-40 7	4.7
3	a	•••	7692	A 28	22 0.6	-47 33	1.0
4	μ^1		7756	A 35	22 8.4	-41 56	5.0
5	μ^2		7763	A 36	22 9.2	-42 13	5.4
6	δι		7828	A 42	22 22·I	-44 7	4.3
7	δ^2		7830	A 43	22 22.6	-44 22	4.4
8	β		7904	A 57	22 35.6	-47 32	2.2
9	ρ		7916	A 59	22 36.5	-42 2	5.3
10	η		7925	A 61	22 38.3	-54 8	5.1
	12 49						
11	•		7946	A 68	22 41.3	- 51 57	3.2
12	5		8008	A 77	22 53.8	-53 24	4.0
13	θ		8043	A 84	23 0.1	-44 10	4.3
14	· ·		8067	A 90	23 3.6	—45 54	3.9

Lac. 8912 (5.8); Lac. 8964 (5.8); Lac. 8976 (5.8); Lac. 9076 (5.7); π (5.9); Lac. 9136 (5.6); Lac. 9229 (5.9); Lac. 9275 (5.8); Lac. 9328 (5.9); Lac. 9353 (5.6); Lac. 9369 (5.7); Lac. 9367 (5.9); ϕ (5.8); Lac. 9470 (5.7).

40. HERCULES.

Fr. Hercule; Germ. Hercules.

				R.A.	Decl.
				h. m.	
Meridional Cen	tre of Constellation			17 10	+ 27
Approximate Boundaries,	/ Preceding			15 55	*
	Following	***		18 55	
	North				+ 51
1900.	South		1		+ 4

Hercules is a large and important constellation, distinguished alike by its naked-eye and its telescopic objects. The chief stars are: -

			Mag.	1			Mag.
β		 	2.8	η		 	3.7
5		 	3.1	γ		 	3.8
a		 	3.2	τ		 	3.9
δ		 	3.3			 	3.9
π		 	3.4	1 8		 	3.9
μ	***	 	3.5	F	1. 109	 ,,,	3.9

There are 37 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
The same	1			3/8/1/8/3	h. m.	0 /	100
1	X	I	5271	2658	15 48.6	+42 47	4.2 : 4.2
2	υ	6	5338	2694	15 59.1	+ 46 22	4.7 : 4.6
3	κ^1	7	5367	2706	16 2.7	+17 22	5.1 : 2.0
4	φ	11	5388	2713	16 5.0	+ 45 15	4.5 : 4.1
5	7	22	5463	2745	16 16.1	+ 46 36	3.9 : 3.6
6	γ	20	5466	2747	16 16.6	+ 19 26	3.8 : 3.6
7	ω	24	5490	2757	16 19.9	+ 14 19	4.7 : 4.7
8	9	30	5523	2772	16 24.7	+42 9	2.1 : 2.1
9	β	27	5525	2774	16 25.1	+ 21 45	2.8 : 2.7
10	8		5527	2776	16 25.4	+ 20 45	4.7 : 4.9
11	h	29	5532	2780	16 27.0	+ 11 45	5.0 : 2.5
12	σ	35	5552	2787	16 30.5	+ 42 42	4.5 : 4.1
13		42	, 5596	2802	16 35.5	+ 49 20	5.5 : 4.8

			,				
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
					h. m.	0 /	
14	5	40	5604	2807	16 36.8	+ 31 49	3.1 : 2.6
15	η	44	5617	2810	16 38.8	+39 9	3.7 : 3.6
		11		AND DESCRIPTION OF			
16		52	5667	2826	16 45'7	+ 46 12	5.0 : 5.0
17		51	5677	2830	16 46.8	+ 24 52	5.5 : 2.0
18	€	58	5731	2844	16 55.7	+ 31 6	4.0 : 3.8
19	•••	[32]	5749	2849	16 57.6	+ 14 18	5.1 : 5.3
20		60	5765	2859	16 59.8	+ 12 54	4.9 : 4.9
		. 22	200 A 183				
21				2872	17 5.7	+40 56	5.1
22	a	64	5821	2879	17 9.2	+ 14 32	3.5 : 3.0
23	δ	65	5828	2880	17 10.1	+ 24 .59	3.3 : 3.5
24	π	67	5834	2885	17 10.9	+ 36 57	3.4 : 3.6
25	u	68	5842	2890	17 12.9	+ 33 14	4.9 : 2.1
	1						
26	e	68	5847	2893	17 13.5	+ 37 25	4.9 : 4.2
27		•••	5856	2900	17 15.0	+ 18 11	5.1 : 2.0
28	P	75	5386	2914-5	17 19.6	+ 37 16	4.1 \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
29	λ	76	5922	2933	17 25.9	+ 26 12	4.3 : 4.7
30	ı	85	5990	2959	17 36.1	+ 46 4	3.0 : 4.1
21		86	6021	2076	17 41.8	+ 27 48	3.2 : 3.2
31	μ θ		6082	3004	17 52.1	+ 37 16	3.2 : 3.2
32	E	91	6084		17 53.1	+ 29 16	3.0 : 4.0
33	v	92	6087	3007	17 53 9	+ 30 12	4.6 : 4.6
34	-	94	6094	3010	17 54.7	+ 16 46	4'5 : 4'5
35		93	0094	3010	1 541	10 40	73 . 45
36		95	6106	3026-7	17 56.4	+ 21 37	4.6 : 4.4
37		96	6110	3033	17 57.3	+ 20 50	5.1 : 2.5
38	0	103	6150	3048	18 2.9	+ 28 45	40: 3.7
39		100	6151-2	3049-50	18 3.0	+ 26 5	5.2 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
40		102	6157	3051	18 3.6	+ 20 49	4.2 : 4.3
	ALL DE	THE REAL PROPERTY.			3 35		
41		101	6159	3053	18 3.7	+ 20 3	5.3 : 2.3
42			6162	3055	18 4.0	+ 43 27	2.1 : 2.0
43	A	104	6178	3065	18 7.4	+ 31 22	4.9 : 2.1
44		106	6231	3091	18 15.2	+ 21 55	4.8 : 5.0
45	t	107	6238	3097	18 16.3	+ 28 49	2.0 : 2.5
10000	1 1000	1	1000111111111111				

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
	100				h. m.	0 /	
46		109	6251	3107	18 18.6	+ 21 43	3.9 : 4.2
47		IIO	6387	3171	18 40.5	+ 20 26	4.3 : 4.0
48		111	6397	3178	18 41.7	+ 18 3	4.2 : 4.3
49		113	6453	3209	. 28 49°7	+ 22 30	4.6 : 4.8

F1. 2 (5·5); r (5·3); B.A.C. 5460 (5·5); F1. 25 (5·5); n (5·5); H.P. 2782 (5·3); i (5·5); F1. 66 (5·5); H.P. 2902 (5·4); F1. 70 (5·3); i (5·4); B.A.C. 5900 (5·4); i (5·5); F1. 87 (5·4); i (5·3); F1. 98 (5·4); i (5·4); B.A.C. 6245 (5·5); F1. 112 (5·5).

41. HOROLOGIUM.

Fr. L'Horloge; Germ. Die Pendeluhr.

				R.A. h. m.	Decl.
Meridional Cent	tre of Constella	tion	 	3 20	-52
	/ Preceding		 	2 0	
Approximate	Following		 	4 20	
Boundaries,	North		 		-42
1900.	South		 		-65

Horologium has one conspicuous star, a, of mag. 3.8, and 4 stars of mags. $4-5\frac{1}{2}$.

No.	etter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
1 2 3 4 5	ζ δ α		839 956 972 1299	A 14 A 32 A 33 A 63 A 66	h. m. 2 36.9 2 56.5 3 0.8 4 6.8 4 10.0	0 / -55 4 -64 33 -60 12 -42 18 -42 35	5.5 5.2 5.3 5.3 3.8

 λ (5.8); η (5.6); Lac. 859 (5.6); R. 87 (5.7); Lac. 1144 (5.9); Lac. 1424 (5.8).

42. HYDRA.

Fr. Hydre; Germ. Die Wasserschlange.

			R.A.	Decl.
			h. m.	0
Meridional Cent	tre of Constellation	 	11 0	-12
Approximate Boundaries,	Preceding	 	8 10	
	Following	 	4 50	
	North	 		+10
1900.	South	 		-35

Hydra is a long and straggling constellation, extending through more than 6^h of R.A. in a direction nearly E. and W. The following are its chief stars, and of these one only is at all prominent:—

			Mag.			Mag.
a (Al	phard)		2.0	π	 	3.5
\$			3.3	€	 	3.6
ν		2	3.3	θ	 	3.9
γ			3.4	λ	 	3.9

There are 32 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
Tage 1					h. m.	0 /	
1	δ	4	2901	1588	8 31.3	+ 6 7	4.1 : 4.5
2	σ	5	2911	1589	8 32.5	+ 3 46	4.4 : 4.4
3		6	2929	1594	8 34'3	— 12 3	5.3
4		9	2940	1596	8 36.2	- 15 31	5.0
5	η	7	2945	1599	8 37.0	+ 3 50	4.2 : 4.4
6	€	11	2971	1608	8 40.4	+ 6 52	3.6 : 3.5
7		12	2975	1610	8 40.7	- 13 6	4.4
8			2976	1611	8 41.2	— I 27	5.1 : 2.1
9	ρ	13	2978	1613	8 42.1	+ 6 17	4'3 : 4'7
10		14	2987	1614	8 43.3	- 3 0	5.1 : 2.1
				2024			
11	5	16	3032	1629	8 49.1	+ 6 24	3.3 : 3.4
12	θ	22	3146	1676	9 8.1	+ 2 49	3.9 : 4.0
13		26	3184	1687	9 14.0	— 11 28	4.9
14		27	3188	1688	9 14.6	- 9 3	4.9 : 2.0
15	а	30	3223	1698	9 21.7	- 8 8	2.0 : 5.5

16 17 18 19 20 21	τ¹ τ² ι κ	31 32 35	3237 3253 3303	1700 1704 1714 1720 1734	h. m. 9 21·8 9 23·1 9 25·9 9 27·7 9 33·9	- 2 1 49 - 2 1 5 - 0 39 - 20 36	5.0 4.9 : 5.0 4.6 : 4.8 5.2
17 18 19 20	τ ¹ τ ² ι	31 32 35	3 ² 37 3 ² 53 33 ⁰ 3	1704 1714 1720	9 23·1 9 25·9 9 27·7	- 2 15 - 0 39 - 20 36	4.6 : 4.8
18 19 20	τ² ι	32 35 38	3 ² 53 33°3	1714	9 25.9	- 0 39 - 20 36	4.6 : 4.8
19 20 21	 ι к	35 38	3303	1720	9 27.7	- 20 36	
20	κ	35	3303	The second	Series News		5.3
21	к	38		1734	9 33.9		
			3311			- 0 36	4.5 : 4.4
22			0747	1739	9 34.6	-13 47	4.9
		•••		1741	9 35.8	- 23 4	4.6
23	•••			1743	9 36.8	- 23 23	4.9
24	v1	39	3372	1759	9 45'7	-14 17	4'3
25			3391	1768	9 48.8	- 25 22	2.1
26	v ²	40	3444	1789	9 59'3	- 12 29	4.7
27	λ	41	3473	1800	10 4.7	-11 46	3.9
28	μ	42	3568	1837	10 20'3	- 16 13	4.1
1 58.3	Benzy 1		3638	1870	10 31.6	- 26 47	5.5
30	ϕ^3		3646	1875	10 32.7	- 16 15	5.3
30	4		304		0= 200		
31	ν		3715	1893	10 43.7	- 15 34	3.3
32	Ψ	45	4395	2222	13 2.6	- 22 29	5.1
33	γ	46	4450	2249	13 12.4	- 22 32	3.4
34		47	4657	2366	13 51.8	- 24 23	2.1
35	π	49	4685	2378	13 59.6	- 26 6	3.2
36	Service of the last	50	4708	2387	14 5'9	— 26 42	5.2
37	***	51	4763	2417	14 16.2	- 27 I2	4.9
38	2,339	52	4784	2427	14 21.1	- 28 57	5.0
	•••	54	4865	2463	14 39 1	- 24 56	5.0
39		58	4891	2477	14 43.2	- 27 27	5.0

Fl. 15 (5.5); ω (5.6); Fl. 19 (5.5); Fl. 23 (5.4); Fl. 24 (5.5); B.A.C. 3226 (5.3); H.P. 1769 (5.3); B.A.C. 3471 (5.3); B.A.C. 3521 (5.5); Fl. 44 (5.4); B.A.C. 3637 (5.4); Lac. 4739 (5.7); B.A.C. 4253 (5.5); B.A.C. 4767 (5.4).

43. HYDRUS.

Fr. L'Hydre Måle; Germ. Die kleine Wasserschlange.

			R.A. h. m.	Decl.
Meridional Cent	tre of Constellatio	n	 2 40	-72
Approximate Boundaries, 1900.	Preceding		 0 20	
	Following		 4 40	
	North			-60
	South	•		-81

This constellation is by young astronomers sometimes confused with Hydra, but the two are quite distinct. The following are the principal stars:-

			Mag.
B	 	 	2.7
a	 	 	2.9
7	 	 	3.2

There are 5 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 ,	
I	β		88	A 5	0 19.4	— 77 56	2.7
2	η^2		603	A 21	1 51.9 *	-68 14	4.9
3	а		623	A 24	I 55°0	-62 9	2.9
4	δ		756	A 38	2 19.6	-69 12	4.1
5	€		849	A 44	2 37.7	-68 47	4.5
140							
6	5		882	A 47	2 43.7	-68 7	5.5
7	ν		928	A 50	2 51.3	— 75 33	5·1
8	γ		1230	A 62	3 49.2	-74 36	3.5

$$\lambda$$
 (5.6); π^{1} (5.9); π^{2} (5.9); μ (5.6); θ (5.8); ι (5.9).

44. INDUS.

Fr. L'Indien; Germ. Der Indianer.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constell	ation	 	21 20	-58
	/ Preceding	•••	 	20 0	
Approximate	Following		 	22 0	
Boundaries,	North		 		-45
1900.	South		 		-75

Indus is a small and straggling Southern constellation, with not much to distinguish it: ε is remarkable for its great proper motion. The chief stars are:—

There are 6 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B,A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. oxford.
					h. m.	0 ,	200
I	α		7096	Aı	20 29.1	-47 43	3.1
2	η		7154	A 2	20 35.2	- 52 20	4.7
3	5		7192	A 4	20 41.2	- 46 40	5.3
4	β		7228	A 6	20 45.4	- 58 54	3.7
5	θ		7388	A 25	21 11.3	- 53 57	4.6
6	γ		7423	A 34	21 17.7	- 55 13	5 var.
7	δ		7633	A 60	21 49.7	- 55 34	4.8
8	€		7656	A 64	21 54.2	-57 16	5.3

 $[\]nu^{1}$ (5.6); ι (5.6); μ (5.8); σ (5.7); (ϵ 5.2); ν^{2} Lac. 9082 (5.7); Lac. 9117 (5.9); Lac. 9337 (5.8).

45. LACERTA.

Fr. Le Lézard; Germ. Die Eidechse.

				R.	A. m.	Decl.
Meridional Cen	tre of Constell	ation	 	22		+ 43
	/ Preceding		 	21	55	
Approximate	Following		 	22	55	
Boundaries,	North		 			+ 55
1900.	South		 			+ 35

Lacerta is a small Northern constellation, with little to distinguish it. Its largest star, a, is only of mag. 3.9, but there are no less than 15 stars of mags. 4—5.2.

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford. or Arg. :
1 2 3		I	7765 7777 7800	3935 3944 3953	h. m. 22 8·7 22 10·7 22 16·1	0 / + 39 7 + 39 9 + 45 56	4·6 : 4·6 4·8 : 4·6

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnite Harv or Arg. :	
10010					h. m.	0 ,		
4	β	3	7815	3959	22 18.9	+ 51 38	4.2 :	4'5
5		4	7820	3962	22 19.7	+ 48 52	4.6 :	4'9
6			-0	0-		1 6		11111
0		5	7845	3980	22 24.6	+ 47 6	4.6 :	4.2
7		6	7850	3985	22 25.3	+ 42 30	4.6 :	4.4
8	a	7	7855	3987	22 26.4	+49 40	3.9 :	4°I
9		9	7888	4001	22 32.5	+ 50 56	4.8 :	4.9
10		10	7901	4005	22 33.9	+ 38 26	5.0 :	5'2
11		11	7906	4011	22 35'3	+ 43 39	4.7 :	4.8
12		12	7915	4014	22 36.1	+ 39 37	5.1 :	5.3
13		13	7932	4022	22 38.7	+41 11	5.1 :	5.1
14		15	7972	4042	22 46.7	+ 42 39	5.1 :	5'3
15			7995	4058	22 51.2	+49 6	5.5 :	5.5
16			7999	4060	22 51.8	+48 2	2.1 :	5.3

B.A.C. 7705 (5.3); B.A.C. 7746 (5.4); Fl. 8 (5.3).

46. LEO.

Fr. Le Lion; Germ. Der Löwe.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constell	ation	 	10 30	+ 15
	/ Preceding		 	9 20	
Approximate Boundaries,	Following		 	11 55	
	North	•••	 		+ 30
1900.	South		 		+ 4

In Leo we have an important and interesting constellation, one prominent feature of which, the group of stars forming "The Sickle," is known to most star-gazers. The chief stars are:—

	Mag.	1			Mag.
a (Regulus)	 1.4	θ	 		3.5
γ,	 2.2	η	 		3.6
β (Denebola)	 2.2	5	 	2	3.6
δ	 2.8	0	 		3.8
£	 3.1	PARTY.			

There are 23 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford,
			2204	1600	h. m.	0 /	4.6
I	κ	I	3204	1692	9 17.7	+ 26 42	4.6 : 4.7
2		4	3246	1710	9 24.9	+ 23 30	4.4 : 4.2
3	£	5	3250	1711	9 25.5	+ 11 50	5.3 : 5.3
4	6	14	3312	1740	9 34.8	+ 10 26 + 24 20	3.8 : 3.7
5		17	3331	1747	9 30.1	T 24 20	3.1 : 3.4
6	μ	24	3371	1760	9 45'9	+ 26 34	4.1 : 3.9
7	π	29	3415	1782	9 53.9	+ 8 37	5.0 : 2.3
8	η	30	3453	1793	10 0.8	+ 17 21	3.6 : 3.2
9	A	31	3457	1795	10 1.2	+ 10 35	4.6 : 4.9
10	а	32	3459	1797	10 2.0	+ 12 33	1.4 : 1.5
11	5	36	3508	1811-2	10 10.0	+ 24 I	3.6 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
12		40	3522	1821	10 13.3	+ 20 5	5.0
13	γ	41	3523	1823-4	10 13.4	+ 20 27	2.5 3.7 2.1
14	ρ	47	3609	1859	10 26.5	+ 9 56	4.0 : 4.0
15		48	3621	1863	10 28.5	+ 7 34	5.5 : 2.0
16		54	3742	1908	10 49.1	+ 25 23	4.3 : 4.5
17	d	58	3768	1921	10 54.4	+ 4 16	5.0 : 2.0
18	c	59	3769	1922	10 54.5	+ 6 44	5.1 : 5.1
19	p^1	61	3775	1924	10 55.7	+ 1 50	5.0 : 5.1
20	b	60	3776	1925	10 55.9	+ 20 49	4.2 : 4.6
2 I	x	63	3788	1931	10 58.8	+ 7 59	4.7 : 5.0
22	δ	68	3834	1949	11 7.7	+ 21 11	2.8 : 2.2
23	θ	70	3838	1951	11 7.9	+ 16 5	3.2 : 3.4
24		72	3842	1952	11 8.8	+ 23 45	4.9 : 5.0
25	φ	74	3848	1956	11 10.6	+ 3 0	4.2 : 4.3
26	σ	77	3862	1965	11 15.0	+ 6 41	4.1 : 4.1
27	ı	. 78	3877	1969	11 17.7	+ 11 12	4.0 : 4.3
28	τ	84	3900	1978	11 21.8	+ 3 31	5.1 : 2.3
29	e	87	3916	1987	11 24.2	- 2 20	5.0 : 2.1
30	υ	91	3946	2003	11 30.8	- 0 10	4.5 : 4.3
31		93	3990	2022	11 41.8	+ 20 53	4.6 : 4.4
32	β	94	3995	2025	11 42.9	+ 15 15	5.3 : 5.I

 ω (5.6); h (5.4); ψ (5.7); g (5.3); ν (5.3); l (5.3); p^5 (5.5); n (5.5); Fl. 75 (5.4); Fl. 79 (5.4); Fl. 81 (5.5); Fl. 92 (5.5); o (5.4).

47. LEO MINOR.

Fr. Le Petit Lion; Germ. Der kleine Löwe.

			R.A.	Decl.
Meridional Cen	tre of Constellation		 10 20	+ 33
1925	/ Preceding		 9 20	
Approximate Boundaries.	Following		 11 0	
	North	9		+44
1900.	South			+ 23

Leo Minor lies to the N. of Leo Major. Its brightest star is Fl. 46 of mag. 3.9. There are 7 stars of mags. 4—5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
	100				h. m.	0 /	
I		10	3261	1717	9 26.9	+ 36 56	4.7 : 4.6
2		19	3399	1771	9 50.3	+41 38	2.5 : 2.5
3		21	3446	1792	10 0.4	+ 35 50	4.6 : 4.4
4		30	3560	1834	10 19.0	+ 34 25	5.1 : 4.8
5	β	31	3572	1840	10 20.0	+ 37 19	4.4 : 4.5
6		37	3640	1872	10 32.0	+ 32 36	4.8 : 4.9
7		41	3671	1884	10 36.9	+ 23 49	5.1 : • 2.1
8		46	3728	1902	10 46.6	+ 34 52	3.9 : 4.0

Fl. 8 (5.5); Fl. 11 (5.5); Fl. 15 (5.3); Fl. 23 (5.4); Fl. 34 (5.5); Fl. 42 (5.4).

48. LEPUS.

Fr. Le Lièvre; Germ. Der Hase,

			R.A.	Decl.
			h. m.	0
Meridional Cent	5 25	- 20		
A	Preceding	 	4 55	
Approximate Boundaries, 1900.	Following	 	6 5	
	North	 		- 9
	South	 		-27

Lepus is a small constellation immediately south of Orion, with the following conspicuous stars:-

1		Mag.			Mag.
α	 	 2.7	ζ	 	3.7
B	 	 3.0	η	 	3.7
			γ	 	3.8
и	I	 3.3	Maria San San San San San San San San San Sa		

There are 12 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1830,	Magnitude. Harv. or Arg. : Oxford.
				12.50	h. m.	0 /	
1			1553	889	4 56.2	- 20 14	5.0
2			1559	892	4 57'3	- 26 27	5.0
3	•	2	157,5	901	5 0.4	- 22 32	3.3
4	ı	3	1608	927	5 6.7	-12 I	4.7
5	μ	5	1616	929	5 7.5	- 16 21	3.3
6	K	4	1617	931	5 7.6	-13 5	4.6
7		•••	1634	943	5 10.6	— 27 5	4.7
8	λ	6	1653	959	5 14.1	-13 18	4.3
9	ν	7	1654	960	5 14.4	- 12 26	5.3
10				963	5 15.3	- 2I 2I	4.6
	129						TOTAL STATE
11		8	1679	972	5 18.0	-14 2	5.1
12	β	9	1715	994	5 23.1	- 20 51	3.0
13	a	11	1741	1014	5 27.4	— 17 55	2.7
14	γ	13	1823	1057	5 39.5	- 22 29	3.8
15	5	14	1840	1065	5 41.5	- 14 51	3.7
						Part of the	, all the second
16	. δ	15	1871	1086	5 46.2	- 20 53	4.0
17	η	16	1901	1101	5 50.9	-14 11	3.7
18		17	955	1130	5 59.6	- 16 29	4.9
19	θ	18	1959	1134	6 0.7	- 14 55	4.6

H.P. 897 (5.5); B.A.C. 967 (5.3); Fl. 10 (5.4); B.A.C. 1965 (5.4); Fl. 19 (5.5); H.P. 1143 (5.5).

49. LIBRA.

Fr. La Balance; Germ. Die Wage.

			R.A.	Decl.
Meridional Cent	tre of Constellation	 	15 10	-14
	Preceding	 	14 20	
Approximate Boundaries, 1900.	Following	 	16 0	
	North	 		- I
	South	 		-30

Libra is situated so low down towards the Southern horizon as regards England that it is not always easy to get hold of it,

especially as it is a summer constellation. The chief stars are:-

		Mag.			Mag.
β		 2.7	Fl. 39	 	3.9
a		 3.0	Fl. 40	 	3.9
Fl. 20	3	2.2			

There are 13 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
			The second		h. m.	0 1	
I	a	9	4°95	2480	14 44.2	- 15 32	3.0
2		11	4898	2483	14 44.8	— 1 48	5.5
3		16	4927	2499	14 50.9	- 3 51	4.5
4	δ	19	4939	2506	14 54.6	— 8 2	4.9
5		20	4950	2514	14 57'1	- 24 48	3.5
		III W		BE 30			
6	L!	24	4995	2531	15 5.4	- 19 20	4.9
7	β	27	5034	2539	15 10.6	- 8 56	2.7
8	€	31	5074	2557	15 17.7	- 9 53	5.5
9		37	5125	2586	15 29.6	- 9 39	4'9
10			5129	2587	15 27.9	- 8 47	5.0
O VII				0	.00	The second	
II	γ	38	5134	2589	15 28.8	-14 23	4.0
12		39	5138	2595	15 29.7	- 27 44	3.9
13		40	5151	2601	15 31.3	- 29 23	39
14		42	5166	2610	15 33.3	- 23 26	5.5
15	к	43	5176	2618	15 35.0	- 19 17	5.0
-6				26.40	6	10.18	***
16	λ	45	5251	2650	15 46.4	- 19 48	5.0
17	θ	46	5257	2655	15 47.0	- 16 23	4.3
18	•••	48	5290	2670	15 51.5	— 13 56	4.8

 μ (5.4); Fl. 8 (5.3); ξ (5.8); ν (5.4); B.A.C. 5109 (5.4); ζ (5.4); Fl. 36 (5.3) η (5·5); H.P. 2708 (5·5).

50. LUPUS.

	Fr. Le Loup	; Gei	m. De:	r Wolf.			
		447			R.	A.	Decl.
-					h.	m.	•
Meridional Centre of Constellation							-40
THE RESERVE	/ Preceding				14	0	
Approximate	Following			14.	16	0	
Boundaries,	North						-29
1900.	South	5.000		TAN SE			-55

Lupus is a Southern constellation, practically invisible in England, but with a large number of conspicuous stars, of which an unusual proportion are doubles. Its chief stars are:—

		Mag.	1				Mag.
α	 	2.6		δ	 1	N	3.7
β	 	2.8		•	 		3.7
γ	 	3.2		η	 ·		3.7
\$	 	3.6		L	 		3.8
d1		2.6					

There are 23 stars of mags. $4-5\frac{1}{2}$.

				0	32.	Salah DAGA	
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
		35.85	S LA A S		h. m.	0 ,	
1			4734	A I	14 11.7	-45 30	3.8
2	71		4768	A 9	14 18.4	-44 41	5.3
3	τ	••••	4770	A. 10	14 18.5	-44 50	4.9
4	σ		4801	A 15	14 24.5	- 49 56	5.2
5	ρ	•••	4821	A 20	14 29.8	- 48 54	4.5
6	а		4839	A 27	14 34.0	-46 52	2.6
7	0		4892	A 35	14 43.8	-43 5	5.0
8	β		4924	A 41	14 50.7	- 42 39	2.8
9	π		4948	A 47	14 57.0	-46 35	4.3
10	λ		4973	A 57	15 0.8	-44 49	4.8
11	К		4986	A 62	15 3.6	-48 17	4.1
12	5		4989	A 64	15 3.7	-51 38	3.6
13			4994	A 66	15 4.8	-44 2	5.2
14		1	5009	A 69	15 7.3	-31 4	5.2
15		2	5032	2540	15 10.0	- 29 42	4.7
16	μ		5028	A 75	15 10.2	-47 26	5.0
17	δ		5046	A 83	15 13.5	-40 13	3.7
18	ϕ^1		5054	A. 88	15 14.2	- 35 50	3.6
19	•		5056	A 91	15 14.6	-44 16	3.7
20	ϕ^2		5060	A 92	15 15.5	- 36 26	2.1
21			5069	A 97	15 17.5	- 38 18	. 5'1
22	γ		5118	A 113	15 27.2	- 40 46	3.3
23			5123	A 114	15 27.6	- 44 33	5.1
24	ı		5139	A 117	15 30.0	- 42 10	4.7
25	41	3	5160	2605	15 32'1	-34 1	4.6

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
W.		114818			h. m.	0 ,	
26			5165	A 121	15 33.0	-44 16	5.3
27	ψ^2	4	5173	A 125	15 35.0	- 34 19	5.1
28	X	5	5227	2637	.15 43'3	-33 16	4.0
29	Ė		5268	2659	15 49.2	-33 37	4.2
30			5282	A 144	15 51.3	-4I 23	5.5
31 32	η θ		5292 5331	A 146 A 157	15 52·2 15 58·7	$\begin{bmatrix} -38 & 3 \\ -36 & 28 \end{bmatrix}$	3 ⁷ 7

Lac. 5891 (5.7); Lac. 5950 (5.9); Lac. 6070 (5.8); Lac. 6124 (5.7); Lac. 6198 (5.8); Lac. 6209 (5.7); Lac. 6280 (5.8); Lac. 6322 (5.8); Lac. 6356 (5.9); Lac. 6380 (5.9); Lac. 6486 (5.8); Lac. 6514 (5.9), ? Var.); Lac. 6644 (5.6).

51. LYNX.

Fr. Le Lynx; Germ. Der Luchs.

			R.A.	Decl.
			h. m.	0
Meridional Cent	re of Constellation	 	7 50	+ 45
	Preceding	 	6 10	
Approximate	Following	 	9 30	
Boundaries,	North	 		+63
1900.	South	 		+34

The stars in Lynx are rather troublesome to find and identify, there being but two prominent ones, namely:—

			Mag.
α	 		 3.4
Fl. 38	 	25.00 B	 3.8

But there are as many as 15 of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
					h. m.	0 /	
1		2	2007	1168	6 9.1	+ 59 3	4.3 : 4.7
2	b	12	2187	1261	6 35.7	+ 59 33	4.7 : 4.8
3		15	2248	1302	6 46.9	+ 58 35	4.5 : 4.7
4			2379	1367	7 9.4	+49 41	4.8 : 4.9
5		19	2407	1378	7 13.1	+ 55 30	5.5 : 2.5

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
		- X		TOPE SUS	h. m.	0 ,	
6	·	21	2441	1392	7 17.7	+ 49 27	4.6 : 4.9
7		24	2516	1441	7 32.8	+ 58 59	4.9 : 5.1
8	1 }	Camel.	2532	1448	7 35.0	+ 50 42	5.2 : 5.5
9	E	27	2697	1509	7 59.4	+ 51 51	4.8 : 5.0
10	•••	31	2793	1539	8 14.6	+ 43 35	4.4 : 4.6
11	f	35	2989	1616	8 43.9	+44 11	5.3 : 2.4
12	}	Ursæ	3059	1641	8 52.9	+ 42 16	4.5 : 4.1
13			3097	1653	8 58.9	+ 38 56	4.7 : 4.7
14		36	3131	1671	9 6.0	+ 43 43	5.3 : 5.1
15	A	38	3162	1681	9 11.4	+ 37 19	3.8 : 3.9
16	а	40	3178	1685	9 13.8	+ 34 54	3'4 : 3'2
17			3265	1719	9 27.7	+40 9	5.0 : 4.9

Fl. 1 (5·4); Fl. 5 (5·5); H.P. 1198 (5·4); Fl. 13 (5·4); Fl. 14 (5·4); Fl. 18 (5·3); H.P. 1401 (5·5); Fl. 22 (5·4); H.P. 1460 (5·5); Fl. 29 (5·4); Fl. 42 (5·3); Fl. 43 (5·5).

52. LYRA.

Fr. La Lyre; Germ. Die Leier.

			R.A.	Decl.
			h. m.	0
Meridional Cent	re of Constellation	 	18 45	+ 36
Approximate	Preceding	 	18 5	
	Following	 	19 20	
Boundaries,	North	 	the time.	+ 48
1900.	South	 		+ 25

Lyra is, as regards its area, relatively a small constellation, but it is marked by the very brilliant star Vega and by a great variety of interesting telescopic objects. Its chief stars are:—

			Mag.
a (V	ega)	 	 0.2
γ		 	 3.2
β		 	 3.6

There are 15 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B,A,C,	Harvard or Argent, Reference.	R.A. 1880,	Decl. 1880.	Magnitud Harv. : O	
111111111111111111111111111111111111111	1045			0.500	h. m.	0 ,	MEXET.	100
1	к	I	6235	3093	18 15.7	+ 36 1	4.4 : .	4.2
2	μ	2	6268	3110	18 20.3	+ 39 27	4'9 :	5.1
3	a	3	6355	3147	18 32.9	+ 38 40	0.5 :	8.0
4	€1	4	6390	3167	18 40.4	+ 39 33	4.6 :	4.4
5	. €2	5	6391	3169	18 40.4	+ 39 29	4.6 :	4.7
	51				0 (100
6	ζ1	6	6392	3172	18 40.6	+ 37 29		4.2
7			•••	3177	18 41.5	+ 26.32	4.9 :	5.0
8	ν	9	6427	3192	18 45.4	+ 32 25		5.3
9	β	10	6429	3193	18 45.7	+ 33 13	3.6	13
10	δ2	12	6466	3210	18 50.3	+ 36 45	4.5 :	4.7
11	7		6.50	2004	TO 4116	1 40 4		4.6
	R var.	1.3	6475	3224	18 51.7	+ 43 47		
12	γ	14	6491	3232	18 54.5	+ 32 32		3.5
13	λ	15	6497	3241	18 55.5	+31 59		5.5
14	•••	16	6520	3254	18 58.0	+ 46 47		2.5
15		17	6553	3271	19 2.9	+ 32 18	4.9 :	2.1
16	1	18	6556	3272	19 3.0	+ 35 55	5.5 :	5.3
17	η	20	6581	3291	19 9'7	+ 38 56	1000	4.7
18	θ	21	6599	3304	10 15.5	+ 37 55		4.6
								4

H.P. 3132 (5·4); H.P. 3146 (5·3); H.P. 3160 (5·5); δ^1 (5·3); B.A.C. 6473 (5·4); B.A.C. 6480 (5·3); H.P. 3236 (5·3); H.P. 3246 (5·5); B.A.C. 6547 (5·5).

53. MONS MENSA.

Fr. La Montagne de la Table; Germ. Der Tafelberg.

			R.A.	Decl.
			h. m.	. 0
Meridional Cen	tre of Constellation	 	5 40	-77
A	/ Preceding	 \$ 40.5 ·	3 10	
Approximate	Following	 75	8 0	
Boundaries,	North	 		-70
1900.	South	 		-85

Mons Mensæ, the "Table Mountain," is usually called Mensa. Its brightest star is only of mag. 5·3; the next is of mag. 5·5, and even by descending as low as mag. 5·8 we can only make up 7 more stars.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 ,	
I		•••	1969	A 32	5 58.4	-79 22	5'3
2	a		2053	A 33	6 13.8	-74 42	5.2

 δ (5.8); Lac. 639 (5.7); Lac. 1654 (5.6); β (5.7); Lac. 1921 (5.8); Lac. 2027 (5.6); Lac. 2097 (5.9); Lac. 2138 (5.8); ζ (5.8); Lac. 2758 (5.6).

54. MICROSCOPIUM.

Fr. Le Microscope; Germ. Das Microscop.

			R.A.	Decl.
			h. m.	0
Meridional Cent	tre of Constellation	 	21 0	-37
Approximate	Preceding	 	20 20	
	Following	 	21 25	
Boundaries,	North	 		-30
1900.	South	 		-45

Microscopium is a small constellation, the brightest star of which, θ^1 , is only of mag. 4.8.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
	12		na Fran		h. m.	0,	
I	ı		7186	A 26	20 40'3	- 44 25	5.4
2	a		7207	A 27	20 42.5	- 34 14	5.1
3	5		7292	A 44	20 55'3	-39 5	5.2
4	θ^1		7397	A 65	21 13.0	-41 18	4.8

Lac. 8517 (5.8); Lac. 8545 (5.8); Lac. 8582 (5.9); Lac. 8606 (5.7); Lac. 8719 (5.7); Lac. 8809 (5.9); Lac. 8833 (5.7).

55. MONOCEROS.

Fr. La Licorne; Germ. Das Einhorn.

			R.A.	Decl,
			h. m.	0
Meridional Cen	tre of Constellati	on	 7 0	- 3
	Preceding		 5 55	
Approximate	Following		 8 30	
Boundaries,	North			+ 12
1900.	South			-13

Monoceros is a constellation with little to attract the naked eye, but it is rich from a telescopic point of view, owing to its position in the Milky Way. Its chief stars are :-

			Mag
Fl. 11	 	 	3.9
Fl. 30	 	 	3.9

There are 25 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
		Dan / 1			h. m.	0 ,	
I		2	1920	IIII	5 53.4	- 9 34	5.1 : 5.1
2		3	1936	1117	5 56.2	— 10 36	4.8
3			1994	1157	6 6.0	- 6 32	5.0 : 4.9
4		5	2015	1170	6 9.0	- 6 I5	4.0 : 4.4
5		7	2040	1188	6 13.9	- 7 46	5.1 : 2.5
6				1189	6 14.0	- 2 53	5.1 : 2.0
7		8	2059	1200	6 17.4	+ 4 39	4.4 : 4.9
8		10	2094	1217	6 22.0	- 4 41	5.0 : 4.8
9		11	2105	1220-1	6 23.0	- 6 57	$3.9 \begin{Bmatrix} 4.7 \\ 5.2 \end{Bmatrix} 4.3$
10				1224	6 25.1	+ 11 38	4.9 : 4.9
II		13	2126	1231	6 26.4	+ 7 26	4.3 : 4.8
12				1238	6 27.6	— I 7	5.0 : 4.7
13			•••	1246	6 30.7	— 5 7	5.5 : 2.6
14	S	15	2185	1256	6 34.4	+10 1	4.6 : 4.6
15	•••	17	2216	1280	6 40.8	+ 8 10	2.0 : 2.0
16		18	2222	1284	6 41.6	+ 2 33	4.8 : 4.9
17			•••	1307	6 48.3	8 58	5.3
18		19	2307	1336	6 57.0	- 4 4	4.8 : 4.8
19		20	2348	1354	7 4'3	- 4 3	5.1 : 4.0
20		22	2358	1359	7 5.7	- 0 18	4.6 : 4.5
21		25	2513	1437	7 31.3	- 3 50	5.1 : 4.9
22	γ	26	2542	1452	7 35.6	- 9 16	4.2 : 4.4
23		27	2660	1498	7 53.7	- 3 21	5.1 : 2.5
24		28	2668	1503	7 55.1	— I 3	4.9 : 4.8
25		29	2725	1516	8 2.6	— 2 38	4.5 : 5.3

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	P.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
26		30	2825	1554	h. m. 8 19.7	- 3 3I	3.9 : 3.6
27		31	2954	1600	8 37.8	- 6 48	4.8 : 4.6

H.P. 1196 (5·3); H.P. 1204 (5·5); H.P. 1262 (5·4); H.P. 1286 (5·3); H.P. 1330 (5·4); B.A.C. 2373 (5·5); H.P. 1527 (5·3).

56. MUSCA AUSTRALIS.

Fr. La Mouche Australe; Germ. Die südliche Fliege.

				R.A. b. m.	Decl.
Meridional Cent	tre of Constella	tion		 12 30	-68
A	Preceding			 II 20	
Approximate Boundaries,	Following			 13 40	
	North		•••		-63
1900.	South				-74

Musca Australis is a small Southern constellation marked by several rather conspicuous stars spread about. The chief are:—

There are 7 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
		300			h. m.	0 /	
1			3984	A 15	11 40.0	-66 4	3.8
2			3993	A 16	11 42.5	-66 8	5'3
3			4011	A 18	11 46.0	- 64 32	5'4
4	•	•••	4129	A 35	12 11.1	-67 17	4.7
5	γ		4224	A 44	12 25.3	-71 28	4.0
6	a		4245	A 45	12 30.0	- 68 28	2.0
7	β		4280	A 51	12 38.9	- 67 27	3'4
8	δ		4353	A 54	12 54.1	−70 54	3.7
9	η		4426	A 59	13 7.1	-67 15	5.3
10			4434	A 62	13 9.1	-66 8	5.2
11			4469	{ A 214 } Cent. }	13 16.0	-63 54	5.5

Lac. 4907 (5.6); ζ^2 (5.8); θ (5.9); ι^1 (5.6).

57. NORMA.

Fr. L' Équerre; Germ. Das Winkelmass.

			R.A.	Decl.
Meridional Cen	tre of Constellation	 	16 0	-49
Approximate	Preceding	 	15 0	
Boundaries.	Following	 •••	16 30	
	North	 		-40
1900.	South	 		-59

Norma is a small and unimportant Southern constellation, the brightest star of which, γ^2 , is only of mag. 4.6. There are 7 other stars between that and mag. $5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
E AND					h. m.	0 ,	
T	i1		5301	A 28	15 53.8	- 57 26	5.4
2	η		5305	A 30	15 54'4	-48 53	5.5
3	δ		5323	A 33	15 58.0	- 44 5I	4.0
4	к		5373	A 40	16 4.0	- 54 19	5.2
5	θ		5390	A 42	16 6.5	-47 3	5.4
6	γ1		5404	A 46	16 8.0	-49 45	5.4
7	\ \gamma^2		5425	A 49	16 10.9	-49 5 ²	4.6
8	μ	•••	5521	A 60	16 25.5	- 43 47	5.2

Lac. 6437 (5.8); λ (5.7); Lac. 6790 (5.9); Lac. 6841 (5.9).

58. OCTANS.

Fr. L' Octant; Germ. Der Oktant.

			R.A.	Decl.
			h. m.	0
Meridional Cent	tre of Constellation		 Polar	
	/ Preceding		 Polar	
Approximate	Following		 Polar	
Boundaries,	North	•••		-73
1900.	South			-90

Octans includes the South Pole, but that Pole is marked by no conspicuous star, the nearest being σ of mag. 5.8. The brightest star in the constellation is ν of mag. 3.8. There are only 4 other stars as bright as mag. $5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
					h. m.	0,	
I	δ		4705	A. 19	14 7.8	-83 7	4.7
2	σ		5959	A 34	18 24.5	-89 17	5.8
3	ν		7481	A 60	21 28.0	— 77 55	3.8
4	β		7886	A 75	22 33.7	-82 I	4.4
5	γ^1		8290	A 86	23 45.0	-82 41	5.2
6	θ.		8342	A 88	23 55.4	—77 43	5'4

 γ^3 (5.6); ζ (5.7); κ (5.7); Brisb. 5046 (5.9); Lac. 6006 (5.9); ρ (5.9); Lac. 7001 (5.8); Lac. 7559 (5.8); α (5.6); λ (5.7); ϵ (5.6); Lac. 9022 (5.9).

59. OPHIUCHUS.

Fr. Le Serpentaire; Germ. Der Schlangenträger.

			R.A.	Decl.	
			h. m.	0	
Meridional Cen	tre of Constellation	 	17 10	- 4	
	Preceding	 	16 5		
Approximate	Following	 	18 40		
Boundaries,	North	 		+16	
1900.	South	 		-30	

Ophiuchus is a constellation much mixed up with Hercules, and it is not always easy to distinguish their respective boundaries. The following are the chief stars:—

		Mag.			Mag.
a	 	 2.2	κ		 3.4
η	 	 2.6	θ		 3.4
δ	 	 2.8	ν		 3.5
\$	 	 2.8	γ	1	 3.8
β	 	 2.9	Fl. 72	•••	 3.8
€	 	 3.4	44,000		

There are no fewer than 30 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
W.g.					h. m.	0 /	
1	δ	1	5414	2726	16 8.1	- 3 23	2.8 : 2.6
2	€	2	5437	2736	16 12.0	- 4 24	3'4 : 3'3
3	Ψ	4	5467	2748	16 17.1	- 19 45	4.6
4	ρ	5	5477	2755	16 18.4	-23 10	4.8
5	x	7	5489	2758	16 50.1	- 18 11	5.0

this etc.		deplet.					
No.	Letter.	Flain- steed.	B,A.C,	Harvard or Argent. Reference.	R.A. 1880.	Desl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 ,	
6	υ	3	5495	2762	16 21.3	- 8 6	4.6 : 4.6
7	φ	8	5516	2771	16 24.3	- 16 21	4'4
8	λ	10	5520	2773	16 24.9	+ 2 15	4.0 : 3.8
9	ω	9	5519	2775	16 25.0	- 21 12	4.7
10	5	13	5548	2788	• 16 30.6	- 10 19	2.8 : 2.8
11			5579	2797	16 34.7	- 17 30	5.5
12		20	5637	2821	16 43.2	- 10 34	4.7
13	ı	25	5692	2832	16 48:3	+ 10 22	4.4 : 4.5
14	к	27	5708	2838	16 52.0	+ 9 34	3.4 : 3.5
15		30	5724	2842	16 54.7	- 4 2	5.0 : 2.0
16	η	35	5781	2868	17 3.2	- 15 34	2.6 : 2.4
17	A ¹	36	5808	2877	17 7.5	- 26 25	4.7
18		41	5830	2882	17 10.2	- 0 18	5.0 : 2.1
19		39	5827	2884	17 10.7	-24 9	5.5
20	Ė	40	5844	2895	17 13.8	- 20 59	4.2
		40	3044	2095	1, 130	20 ,19	4 3
21	θ	42	5851	2899	17 14.7	- 24 53	3.4 : 2.8
22	b	44	5876	2909	17 19 1	- 24 4	4.2
23	d	45	5881	2916	17 19'7	- 29 45	4.4
24			5890	2918	17 20.3	- 4 59	4.6 : 4.7
25	σ	49	5893	2921	17 20.6	+ 4 15	4.4 : 4.4
26		•••	5903	2925	17 22.7	+ 0 27	5.5 : 2.3
27	c^2	51	5907	2927	17 24.1	- 23 52	4.9
28	α	55	5941	2944	17 29'4	+ 12 39	5.5 : 5.5
29	μ	57	5953	2949	17 31.3	— 8 2	4.7 : 4.7
30		58	5987	2960	17 36.3	- 21 37	5.0
31	β	59	. 5996	2962	17 37.6	+ 4 37	2.0 : 2.0
32	γ	62	6020	2979	17 41.9	+ 2 45	3.8 : 3.8
33	ν	64	6078	3005	17 52.4	- 9 45	3.2 : 3.2
34		66	6089	3014	17 54'3	+ 4 23	4.8 ; 4.7
35		67	6092	3017	17 54 7	+ 2 56	4.0 : 4.3
36		68	6101	3023	17 55.7	+ 1 18	4.4 : 4.2
37	τ	69	6104	3028-9	17 56.6	- 8 11	4.9 : 2.1

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.	
					h. m.	0 ,		
38		70	6123	3037	17 59.4	+ 2 32	4.1 : 4.3	
39	à	71	6142	3044	18 1.6	+ 8 43	4.8 : 4.9	
40	1	72	6143	3045	18 1.7	+ 9 33	3.8 : 3.9	
41		74	6227	3089	18 15.0	+ 3 20	5.0 : 2.1	

B.A.C. 5494 (5·4); Fl. 21 (5·5); Fl. 37 (5·5); B.A.C. 5910 (5·4); H.P. 2940 (5·5); H.P. 3138 (5·5); H.P. 3139 (5·3).

60. ORION.

	Fr. Orion	a; Ge	rm. Or	ion.		
					R.A.	Decl.
					h. m.	0
Meridional Cen	tre of Constell	ation		•••	5 20	+ 3
	Preceding Following				4 35	
Approximate	Following				6 10	
Boundaries,	North					+ 21
1900.	South					- I 2

Orion, though not in area the largest, is without doubt the most brilliant and most interesting of all the constellations, distinguished alike for its naked-eye stars and for its telescopic objects. The chief stars are:—

		Mag.			Mag.
β (Rigel)		0.3		 	3.0
a (Betelgeuze)		0.9	π^1 .	 	3.3
€		1.8	η.	 	3.5
γ (Bellatrix)		1.9	λ.	 	3.5
\$	•••	1.9	τ.	 	3.6
к		2.2	σ.	 	3.7
δ (Mintaka)		2.4	π^5 .	 	3.9

There are no fewer than 44 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
ETEN.	1000	A CANE	NE TEN		h. m.	0 /	
1	π^1	ı	1486	840	4 43'3	+ 6 45	3.3 : 3.6
2	π^2	2	1491	841	4 44'I	+ 8 42	4.4 : 4.9
3	π^3	3	1495	845	4 44.8	+ 5 24	4.0 : 4.0
4	π ⁵	8	1514	857	4 48.0	+ 2 15	3.9 : 4.1
5	g	6	1515	858	4 48.2	+ 11 14	5.5 : 2.0

See miles			STATE AND THE				
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
-	-						
6	π4		6	0.00	h. m.	0 /	
	2000	7	1516	859	4 48.3	+ 9 59	4.8 : 5.0
7	02	9	1525	865	4 49.6	+ 13 19	4.3 : 4.5
8	π^6	10	1538	875	4 52.3	+ 1 33	4.7 : 4.7
9		11	1557	894	4 57.7	+ 15 14	4.7 : 4.7
10		15	1591	914	05 2.8	+ 15 27	4.8 : 4.8
11	P	17	1611	928	5 7.0	+ 2 43	4.5 : 4.4
12	β	19	1623	936	5 8.8	- 8 20	0.3 + 1.0
13	7	20	1638	948	5 11.8	- 6 59	3.6 : 3.9
14	0	22	1660	964	5 15.6	- 0 30	4.6 : 4.8
15	m	23	1665	966	5 16.5	+ 3 26	5.0 : 5.2
1	.000			0 0 1 1 1			
16	e	29	1680	973	5 18.2	— 7 55	4.3 : 4.5
17	p	27	1682	974	5 18.4	- I o	2.3 : 2.3
18	η	28	1684	975	5 18.4	— 2 3I	3.5 : 3.7
19	ψ1	25	1685	977	5 18.5	+ 1 44	4.6 : 4.6
20	γ	24	1687	979	5 18.7	+ 6 14	1.9 : 1.8
21	¥2	30	1700	988	5 20.6	+ 2 59	4.7 : 4.6
22		31	1717	997	5 23.6	- 1 11	4.9 : 5.0
23	A	32	1722	1000	5 24.4	+ 5 51	4.3 : 4.4
24	δ	34	1730	1005	5 25.9	- 0 23	2.4 : 2.0
25	υ	36	1731	1007	5 26.1	- 7 23	4.7 : 5.2
26		Para d		1010	5 26.7	- I 4I	5'2 : 5'2
27	ϕ^1	277	1748	1017	5 28.2	+ 9 24	
28	λ	37					
		39	1749	1019		+ 951 - 65	00 00
29	θ1		1752	1021	5 29.2		4.5
30	150	41	1758	1023	5 29.4	- 5 28	4.4 : 4.6
31	θ^2	43	1760	1024	5 29.5	- 5 30	4.9 : 2.1
32	c	42	1759	1025	5 29.5	- 4 55	4.6 : 5.4
33 .		44	1762	1027	5 29.6	- 5 59	3.0 : 3.5
34	•	46	1765	1029	5 30.1	- 1 17	1.8 : 1.8
35	ϕ^2	40	1766	1030	5 30.3	+ 9 13	4.4 : 4.7
36	σ	48	1780	1039	5 32.7	- 2 40	3.7 : 3.9
37	ω	47	1782	1040	5 32.9	+ 4 3	4.5 : 4.3
38	d	49	1785	1041	5 33.1	- 7 17	5.0 : 2.5
39	5	50	1794	1045-6	5 34.7	- 2 0	1.0 2.0 1.8
40				1047	5 34.8	- 1 11	5.1 : 2.3
40		4112	SYG MEN	1047	. 5 340		3 33

	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
ı						h. m.	0 /	
ı	41	к	53	1843	1068	5 42.1	- 9 43	2.2 : 2.4
ı	42		56	1869	1085	5 46.2	+ 1 49	5.0 : 2.1
ı	43	χ^1	54	1876	1089	5 47.3	+ 20 16	4.6 : 5.1
۱	44	a	58	1883	1091	5 48.7	+ 7 23	0.0 +0.0
ı	45		60	1913	1109	5 52.7	+ 0 32	5.5 : 2.1
ı		-						
ı	46				1114	5 54.1	- 3 5	4.7 : 5.0
۱	47	μ	61	1928	1116	5 55.8	+ 9 39	4'3 : 4'7
ı	48	χ^3	64	1934	1119	5 56.4	+ 19 42	5.1 : 2.0
1	49	X4	62	1939	1122	5 56.8	+20 9	4.8 : 4.9
I	50				1124	5 58.4	- 6 42	5.0 : 2.3
ı				0		6	1	
I	51	ν	67	1958	1132	6 0.7	+ 14 47	4.4 : 4.4
1	52	•••		•••	1133	6 0.7	- 4 II	5.5 : 2.3
ı	53	\int_{0}^{1}	69	1989	1152	6 5.1	+16 9	2.0 : 2.3
١	54	€	70	1990	1153	6 5.1	+ 14 14	4.5 : 4.4
1	55		71	2004	1162	6 7.8	+ 19 12	2.1 : 2.3
1	,	7.9	No.			6 01	1 10 10	FIT . FIG
1	56	k2	74	2017	1174	6 9.7	+12 19	5.1 : 2.3
1	57	1	75	2022	1178	6 10.5	+ 9 59	5.5 : 2.3
ı	58		77	2086	1214	6 21.1	+ 0 22	2.5 : 2.0
1								

B.A.C. 1460 (5·3); o^1 (5·4); i (5·4); h (5·3); B.A.C. 1601 (5·3); Fl. 21 (5·4); n^1 (5·5); n^2 (5·3); H.P. 1018 (5·5); o (5·0); b (5·3); Fl. 52 (5·3); Fl. 55 (5·3); H.P. 1142 (5·5); f^2 (5·4); Fl. 73 (5·4).

61. PAVO.

	Fr. Le Paon; Ger	m. De	Pfau.		
				R.A.	Decl.
				h. m.	0
Meridional Cent	re of Constellation			19 10	-65
	Preceding			17 20	
Approximate	Following			21 20	
Boundaries,	North	•••			-56
1900.	South				-74

Pavo is a Southern constellation, the chief stars of which are the following:—

		Mag.			Mag.
a	 	2.1	δ	 	3.5
β	 	3.3	η	 	3.8

There are 17 stars of mags. $4-5\frac{1}{2}$.

_		THE HOUSE	Sales In Co.	AND DESCRIPTION			
No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
	103				h. m.	0 /	
1	η		5963	A 2	17 34.0	- 64 40	3.8
2	π		6100	A 16	17 57.0	- 63 40	4.6
3			6198	A 26	18 129	-61 32	4'4
4	ν		6253	A 33	18 20.2	-62 21	4.8
5	5		6315	A 35	18 29.0	-71 32	4.5
6			6352	A 39	18 33.7	- 64 59	5'3
7	λ		6383	A 45	18 41.1	-62 20	4'3
8	' K		6405	A 46	18 44.6	-67 23	4 var.
9	ω		6436	A 51	18 47.9	- 60 21	5.4
10			6766	A 74	19 40.5	- 59 29	5.2
11	. 6		6801	A 78	19 46.7	-73 I3	4.0
12	1		6807	A 80	19 47.0	- 59 13	5.5
13	δ		6873	A 88	19 56.9	- 66 29	3.2
14		•••	6885	A 78 Telesc.	19 58.2	- 53 13	5'5
15	a		7004	A 99	20 16.2	— 57 7	2.1
16	ϕ^1		7066	A 104	20 25.6	— 60 59	4.9
17	ρ		7082	A 107	20 27.5	-61 56	4'9
18	ϕ^2		7099	A 109	20 30.1	- 60 56	5.2
19	β		7129	AIII	20 34.1	- 66 38	3.3
20	0		7331	A 123	21 2.0	-70 36	5.2
21	γ	•••	7409	A 128	21 18.5	-65 55	4.2

Brisb. 6303 (5.8); Lac. 7944 (5.7); Lac. 7980 (5.8); Lac. 7997 (5.6); Lac. 8156 (5.7); Lac. 8226 (5.9); μ^1 (5.9); μ^2 (5.6); Lac. 8269 (5.7); ν (5.6 Var); σ (5.7); Lac. 8550 (5.9); Lac. 8625 (5.9); Lac. 8782 (5.9).

62. PEGASUS.

Fr. Pégase; Germ. Der Pegasus.

			R.A.	Decl.
全人			h. m.	0
Meridional Cen	tre of Constellation	 	22 30	+17
	/ Preceding	 	21 10	
Approximate	Following	 	0 10	
Boundaries,	North	 		+ 35
1900.	South	 		+ I

The "Square of Pegasus," though one star in Andromeda (a, which is also sometimes known as δ Pegasi) helps to form it, is a group well known to all star-gazers. The chief stars are:—

	Mag.				Mag.
€	 2.4	η	 		3.1
a (Markab)	 2.6	3	 715	1016	3.6
β (Scheat)	 2.6	μ	 		3.7
γ (Algenib)	 3.0	θ	 		3.8

There are 30 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
ARA					h. m.	0 /	
1		1	7418	3761	21 16.5	+ 19 18	4.3 : 4.3
2		2	7474	3792	21 24.5	+23 6	4.3 : 4.5
3		5	7520	3813	21 32.1	+ 18 47	5.2
4	•	8	7561	3836	21 38.3	+ 9 20	2.4 : 2.4
5		9	7567	3842	21 38.8	+ 16 48	4'4 : 4'4
6	К	10	7571	3843	21 39.2	+ 25 4	4'2 : 4'2
7		14	7607	3861	21 44.5	+ 29 37	5.0 : 2.3
8		16	7627	3867	21 47.6	+ 25 22	2.0 : 2.3
9	ν	22	7689	3898	21 59.6	+ 4 28	4.8 : 4.8
10	ı	24	7706	3907	22 1.4	+ 24 46	4.0 : 4.3
11	θ	26	7723	3913	22 4.3	+ 5 36	3.8 : 3.2
12	π^2	29	7731	3917	22 4.7	+ 32 35	4.4 : 4.0
13		30	7788	3948	22 14.4	+ 5 11	5.5 : 2.0
14		31	7796	3951	22 15.6	+ 11 36	2.1 : 2.1
15		32	7798	3952	22 15.8	+ 27 44	4.9 : 2.1
16		35	7827	3965	22 21.8	+ 4 6	5.0 : 5.0
17	5	42	7908	4013	22 35.5	+10 12	3.6 : 3.3
18	0	43	7914	4015	22 36.1	+ 28 40	4.9 : 5.1
19	η	44	7923	4020	22 37.4	+ 29 35	3.1 : 2.9
20	E	46	7943	4024	22 40.7	+ 11 33	4.3 : 4.3
THE LOT	-					1	
21	λ	47	7945	4026	22 40.9	+ 22 56	4.2 : 4.0
22	μ	48	7958	4034	22 44.2	+ 23 58	3.7 : 3.6
23	ρ	50	7988	4051	22 49'2	+ 8 11	5.0 : 5.0
24	β	53	8032	4078	22 58.0	+ 27 26	2.6 : 2.3
25	a	54	8034	4080	22 58.8	+ 14 34	26: 2.3

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
		T TO			h. m.	0 /	
26		55	8051	4084	23 1.0	+ 8 46	4.6 : 4.7
27	•••	56	8052	4085	23 1.3	+ 24 49	4.9 : 4.7
28		59	8078	4102	23 57	+ 8 4	5.1 : 2.3
29	τ	62	8131	4132	23 14.7	+23 5	4.7 : 4.7
30		66	8149	4140	23 17.0	+ 11 39	5.2 : 2.4
31	υ	68	8160	4143	23 19.4	+ 22 45	4.6 : 4.6
32	q	70	8182	4151	23 23.1	+12 6	4.6 : 5.0
33		72	8206	4162	23 28.0	+ 30 40	5'2 : 5'4
34		78	8256	4194	23 38.0	+ 28 42	4.9 : 5.0
35	φ	81	8299	4217	23 46.4	+ 18 27	5.5 : 2.4
36	¥	84	8324	4233	23 51.6	+ 24 28	4.6 : 4.7
37	γ	88	26	23	0 7.0	+ 14 31	3.0 : 2.5
38	x	89	32	28	0 8.4	+ 19 33	4.9 : 4.9

Fl. 7 (5·5); Fl. 12 (5·4); Fl. 13 (5·3); Fl. 17 (5·5); Fl. 23 (5·5); B.A.C. 7753 (5·4); Fl. 37 (5·3); Fl. 38 (5·5); σ (5·3); Fl. 58 (5·3); Fl. 64 (5·4); Fl. 67 (5·5); Fl. 71 (5·4); Fl. 75 (5·4); Fl. 77 (5·4); Fl. 82 (5·3).

63. PERSEUS.

			R.A.	Decl.
			h. m.	0
Meridional Cen	3 20	+42		
	/ Preceding	 	1 30	
Approximate	Following	 	4 40	
Boundaries,	North	 		+ 58
1900.	South	 		+ 30

Perseus is a very brilliant constellation in consequence of its embracing a very rich portion of the Milky Way. Its chief stars are:—

	Mag.						
a (Mirfae)	. 1.9	\$			3.1		
β (Algol)	. 2.3	δ			3.2.		
€	3.0	ρ			3.7		
γ	. 3.1	η			3.9		

There are 38 stars of mags. 4—5.2. Algol is a well-known short-period variable, which is now treated as the type of a class of Variables.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. oxford
					h. m.	0 ,	
1	g	4	614	314	1 54.4	+ 53 55	4.9 : 5.1
2	i	9	721	373	2 14.0	+55 18	5.2 : 5.5
3	C	12	821	427	2 34.8	+ 39 41	4.9 : 5.0
4	θ	13	827	429	2 36.0	+ 48 43	4.5 : 4.3
5	η	15	863	443	2 41.9	+ 55 24	3.9 : 4.1
6		16	871	446	2 43.0	+ 37 49	4.4 : 4.8
7		17	877	449	2 44.2	+ 34 34	4.8 : 4.9
8	7	18	885	454	2 45.8	+ 52 16	4.0 : 4.1
9		21	904	461	2 50.0	+ 31 26	5.3 : 2.4
10	π	22	912	465	2 21.1	+39 11	4.7 : 4.9
11		24	915	468	2 51.7	+ 34 42	5.0 : 2.3
12			918	470	2 52.4	+ 51 54	2.1 : 2.5
13	γ	23	947	. 483	2 56.1	+ 53 2	3.1 : 3.1
14			948	484	2 56.5	+ 56 14	5.0 : 2.0
15	ρ	25	953	489	2 57.5	+ 38 22	3.7 : 4.5
16			962	495	3 0.4	+49 9	4.1 : 4.4
17	β	26	963	496	3 0.4	+40 30	2.3 : 2.4
18	к	27	967	498	3 1.4	+ 44 24	4.0 : 4.1
19	ω	28	981	503	3 3.6	+39 9	4.7 : 4.9
20			995	513	3 7.6	+ 50 29	2.5 : 2.5
21		29	1007	521	3 10.1	+ 49 47	5'3 : 5'4
22		31	1011	522	3 10.7	+ 49 40	5.0 : 2.1
23	1		1017	524	3 11.3	+ 33 46	4.8 : 4.9
24	1	32	1026	532	3 13.5	+ 42 54	4.8 : 5.0
25			1035	537	3 14.7	+ 48 47	5.3
26		22	1043	541	3 15.8	+ 49 26	1.9 : 1.9
26	a	33	1059	552	3 19.6	+ 48 39	5.0 : 5.0
27		24	1066	555	3 20.8	+49 7	4.8 : 5.0
28		34		560	3 22.1	+ 47 35	4.4 : 4.7
30	o y	35	1071	578	3 28.0	+47 48	4.5 : 4.2
	B&C			2 1	FULL BEST	-	3.5 : 3.1
31	δ	39	1129	591	3 34.4	+ 47 24	- 16-34 91
32	0	40	1132	594	3 34.8	+ 33 34	2.0 : 2.0

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
	N. S. S. S.	1100			h. m.	0 ,	
33	0	38	1138	600	3 36.8	+31 54	4.0 : 4.4
34	ν	41	1139	602	3 37.0	+42 12	4.0 : 4.1
35	n	42	1175	626	3 42.1	+ 32 43	5.2 : 5.4
110	1 4.69	- 华夏	BULLY	10000		P#00 (- 3)	
36	5	44	1207	638	3 46.6	+31 34	3.1 : 3.1
37	•	45	1219	649	3 49.8	+ 39 40	3.0 : 3.1
38	₹	46	1228	652	3 51.2	+ 35 27	4'I : 4'3
39	λ .	47	1254	671	3 57.7	+50 1	4.5 : 4.4
40	c	48	1266	682	4 0.0	+47 24	4'3 : 4'3
			110	8057			- Ave-
41	μ	51	1287	702	4 6.1	+48 6	4.5 : 4.5
42	f	52	1291	707	4 6.7	+40 11	4.9 : 4.8
43	b1		1301	719	4 9.2	+50 0	4.6 : 4.8
44		54	1322	733	4 12.6	+ 34 17	5.1 : 5.3
45	d	53	1323	735	4 13.0	+46 13	4.9 : 4.9
46	e	58	1414	793	4 28.4	+41 1	4.4 : 4.6

Fl. 1 (5·5); Fl. 2 (5·4); Fl. 6 (5·4); χ (neb.); Fl. 20 (5·4); H.P. 514 (5·5); Fl. 30 (5·4); H.P. 556 (5·5); Fl. 36 (5·4); B.A.C. 1210 (5·4); A. (5·5); H.P. 647 (5·5); B.A.C. 1314 (5·4); B.A.C. 1364 (5·4); Fl. 59 (5·3).

64. PHŒNIX.

Fr. Phénix; Germ. Der Phönix.

			R.A.	Decl.
Meridional Cen	I 0	-48		
Approximate	Preceding	 	23 20	
Boundaries,	Following	 	2 15	
1000.	North	 		-38
1900.	South	 		-59

Phœnix is a Southern constellation, with the following as its chief stars:—

	Mag.							Mag.
a	 	•••	2.4	€	•••			3.8
β	 	d	3.3					
7	 		3.4					

There are 13 stars of mags. 4-5½.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
The same				Per 90.0	h, m.	0 /	
1	ı		8210	A 9	23 28.6	-43 17	4'4
2	σ		8264	A 19	23 40.9	- 50 53	5.5
3	π		8329	A 29	23 52.7	- 53 ²⁵	5.5
4	€		11	A 39	0 3.3	- 46 24	3.8
5	к		93	A 46	0 20'3	-44 21	3.9
6	а	•••	94	A 48	0 20.4	-42_58	2*4
7	λ	•••	124	A 54	0 25.6	-49 28	4.6
8	μ	•••	183	A 64	0 35.6	-46 44	4.7
9	η	•••	199	A 68	0 37.9	- 58 8	4.2
10	β		317	A 85	I 0.2	-47 22	3.3
				A 88			
11	υ		331		I 2.3	-42 7	5.4
12	5	•••	340	A 89	I 3.3	- 55 54	4.3
13	ν		380	A 93	1 9.8	-46 10	5.3
14	γ		447	A 106	1 23.2	-43 5 ⁶	3.4
15	δ		461	A 109	1 26.3	-49 42	4.0
-6		TO THE	.00	1	.0.0	16 45	0
16	- * * *		582	A 126	1 48.8	-46 53	4.8
17	φ		585	A 127	1 49'4	-43 5	5.2
18		•••	604	A 128	I 52.4	-47 58	5.1

Lac. 9689 (5.8); Lac. 9721 (5.7); Lac. 99 (5.9); Lac. 110 (5.7); Lac. 137 (5.7); Lac. 143 (5.6); Lac. 180 (5.9); ρ (5.6); Lac. 277 (5.6); Lac. 289 (5.9); Lac. 392 (5.8); Lac. 520 (5.8); Lac. 599 (5.9); χ (5.6).

65. EQUULEUS PICTORIS.

Fr. Le Chevalet du Peintre; Germ. Die Malerstaffelei.

				R.	A.	Decl.
	- We 1 10 19			h.	m.	0
Meridional Cent	re of Constell	ation	 	5	30	-52
	/ Preceding		 	4	40	
Approximate	Following		 	6	40	
Boundaries,	North		 			-42
1900.	South		 			-65

This constellation is now generally known as Pictor. Its 2 principal stars are the following:—

α 3·5 β 3·9

There are besides 6 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
	7		36 3 1	m-186	h. m.	0 ,	
1	λ		1473	A 4	4 39 7	- 50 42	5.2
2			1521	A 7	4 48.2	-53 39	5'4
3	η^1		1569	A 10	4 59.6	-49 19	5.2
4	η^2		1589	AII	5 1.8	-49 45	5'3
5	β		1861	A 32	5 44'4	-51 6	3.9
			-				
6	γ	•••	1884	A 35	5 47.6	- 56 II	4.7
7			2013	A 48	6 7.9	- 54 56	5.5
8	a		2260	A 66	6 47.0	-61 49	3.2

 $\zeta(5.8)$; Lac. 1888 (5.7); Lac. 2003 (5.8); Lac. 2052 (5.6); Lac. 2087 (5.8); Brisb. 1172 (5.7).

66. PISCES.

Fr. Les Poissons; Germ. Die Fische.

				R.A.		Decl.
				h.	m.	0
Meridional Cen	tre of Constell	ation	 	0	20	+10
A	Preceding		 	22	45	
Approximate Boundaries,	Following		 	1	40	
	North		 			+ 32
1900.	South	•••	 			- 6

Pisces is an eminently dull constellation to the naked eye, for it possesses no conspicuous stars whatever. The 2 brightest are:—

			mag.
η	 	•••	 3.7
7	 		 3.8

But there are no fewer than 28 stars of mags. 4-5.2.

No.	Letter'	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.	
100	1 200	N. WEEK			h. m.	0 ,		
1	β	4	8031	4077	22 57.8	+ 3 10	4.6 : 4.4	
2	γ	6	8105	4114	23 11.0	+ 2 38	3.8 : 3.6	
3	b	7	8127	4130	23 14'3	+ 4 43	2.1 : 2.0	
4	K	8	8169	4146	23 20.8	+ 0 36	5.0 : 2.5	
5	θ	10	8177	4149	23 21.9	+ 5 43	4.4 : 4.5	

İ	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
-							ESERTE	or Arg. · Oxford.
ı	6					h. m.	0 /	
ı		ı	17	8233	4180	23 33.8	+ 4 59	4.3 : 4.5
ı	7	λ	18	8243	4188	23 35.9	+ 1 7	4.7 : 4.9
ł	8	•••	19	8262	4198	23 40.2	+ 2 49	2.5 : 2.5
ı	9	•••	27	8328	4235	23 52.5	- 4 13	5.0 : 2.3
ı	10	ω	28	8331	4238	23 53.2	+ 6 12	4.3 : 4.3
ı	11		29	8346	4245	23 55.7	- 3 42	5.1 : 2.3
1	12		30	8349	4247	23 55.8	- 6 4I	4.6 : 4.5
1	13		33	8368	4259	23 59.2	- 6 23	4.6 : 4.8
1	14	δ	63	222	125	0 42.5	+ 6 56	4.6 : 4.3
I	15	€	71	288	162	0 56.7	+ 7 15	4.2 : 4.3
ı	16	ψ1	7.4	307-8	169, 170	0. 5012	1 00 70	5.0 : \\ 5.1
1			74		300	0 59.3	+ 20 50	15.3
ı	17	g	82	345	195	I 4.7	+ 30 47	5.1 : 4.9
ı	18	X	84	348	196	1 5.0	+ 20 24	4'9 : 4'9
ı	19	T	83	349	197	1 5.1	+ 29 27	4.7 : 4.3
ı	20	φ	85	365	198	1 7.3	+ 23 56	4.6 : 4.8
ı	21	5	86	368-9	199, 200	1 7.5	+ 6 57	5.0 : 4.9
ı	22	f	89	388	207	1 11.6	+ 2 59	5.1 : 2.3
ı	23	υ	90	395	209	1 12'9	+ 26 38	4.7 : 4.5
1	24	ρ	93	427	226	1 19.8	+ 18 33	5.3 : 2.3
-	25	μ	98	448	237	1 23'9	+ 5 31	5*2 : 5*4
	26	η	99	453	239	1 25.1	+ 14 44	3.7 : 3.7
1	27	ν	106	518	265	I 35.2	+ 4 53	4.7 : 4.7
I	28	0	110	537	272	1 30.1	+ 8 33	4.4 : 4.3
1	29	E	111	574	294	1 47.3	+ 2 36	4.7 : 4.7
1	30	a	113	625	320	1 55.9	+ 2 11	1:0 : [3.7
L	,					- 55 9	The Property of	40 (4·7

A. (5.5); Fl. 34 (5.4); Fl. 47 (5.4); Fl. 52 (5.5); Fl. 55 (5.5); Fl. 64 (5.3); σ (5.6); ψ^2 (5.7); ψ^3 (5.6); π (5.6); Fl. 107 (5.4).

67. PISCIS AUSTRALIS.

Fr. Le Poisson Austral: Germ. Der Südliche Fisch.

17. 110 1 0.	ISSUE ALUSUIA	I, UC	11110. 200	L Duu	TOTTO T T	00==+
					R.A.	Decl.
				243431	h. m.	0
Meridional Cen	tre of Constell	lation			21 40	-32
	/ Preceding				20 50	
Approximate	Following			***	23 0	
Boundaries,	North		•••	•••		- 26
1900.	South			•••		-37

This is sometimes termed Piscis Austrinus, but the designation "Australis" is to be preferred. It has only I conspicuous star:-

Mag. a (Fomalhaut) 1.3

There are 9 stars of mags. 4-5.2.

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
1			7280	∫A 391	, h. m.	0 /	
1		1	100	Mic.	20 23.9	- 32 43	5.0
2		4	7386	3742	21 10.7	- 32 40	4.8
3	ı	9	7557	3834	21 37.8	-33 34	4.5
4	θ	10	7583	3850	21 40.7	- 31 27	5.0
5	μ	14	7701	3908	22 1.4	- 33 34	4.2
6	β	17	7842	3983	22 24.7	-32 58 ·	4'3
7	€	18	7898	4007	22 34'0	- 27 40	4.1
8	γ	22	7966	4038	22 45'9	-33 3i	4.3
9	δ	23	7987	4052	22 49'3	- 33 11	4.4
10	a	24	7992	4057	22 51.0	- 30 16	1.3
11			8025	A 72	22 56.8	- 35 23	5.3

η (5.5); Lac. 9030 (5.4); Lac. 9036 (5.7); Fl. 15 (3.3); Lac. 9063 (5.9); λ (5.6); Lac. 9197 (5.9); Lac. 9321 (5.9); Lac. 9333 (5.9).

68. RETICULUM RHOMBOIDALIS.

Fr. Le Réticule; Germ. Das rhomboidische Netz.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constellation	J		3 50	-63
	Preceding Following			3 10	
Approximate	Following		9	4 50	
Boundaries,	North		Z 19		-55
1900.	South				-69

This small constellation has as its chief stars the following:—

			Mag.
α	 20	 	- 3.3
β	 	 	3.9

There are 5 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
			S-11: (3)		h. m.	0 ,	
1			1103	A 6	3 27.3	-63 21	5.0
2	β		1197	A 14	3 42.4	-65 11	3.9
3	δ		1259	A 18	3 56.9	-61 45	4.7
4	γ		1270	A 22	3 59.2	-62 29	4'7
5		•••	1271	A 23	3 59.4	-61 25	5.1
6	a	•••	1336	A 25	4 12.9	-62 47	3.3
7	€		1344	A 27	4 14.4	- 59 36	4.6

ζ² (5.7); η (5.8).

69. SAGITTA.

Fr. La Flèche; Germ. Der Pfeil.

				R.A.	Decl.
				h. m.	. 0
Meridional Cent	19 50	+18			
	Preceding			19 0	
Approximate	Following			20 20	
Boundaries,	North				+ 2 I
1900.	South	•••			+15

Sagitta, though a small and unimportant constellation, is nevertheless as ancient as the time of Ptolemy. Its principal stars

There are 4 stars of mags. 4-5.2.

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg.: Oxford.	
					h. m.	0 /		
1	a	5	6739	3399	19 34'7	+ 17 44	4.3 : 4.4	
2	B	6	6744	3402	19 37.7	+ 17 12	4.4 : 4.6	
3	8	7.	6783	3421	19 42.1	+ 18 14	3.7 : 3.8	
4	5	8	6794	3424	19 43'7	+ 18 51	5.0 : 4.8	
5	7	12	6858	3466	19 53.4	+ 19 10	3.6 : 3.7	
6		14	6890	3487	19 58.0	+ 15 42	5.5 : 2.2	

ε (5.6); Fl. 10 (5.5); Fl. 11 (5.3); Fl. 13 (5.5); η (5.4).

70. SAGITTARIUS.

Fr. Le Sagittaire; Germ. Der Schütze.

				R.A.	Decl.
				h. m.	0
Meridional Cen	19 0	-25			
Approximate Boundaries.	/ Preceding			17 30	
	Following			20 20	
-	North	•••			-12
1900.	South				-45

Sagittarius is a more important constellation than most dwellers in England are aware of, and the Milky Way materially adds to its attractiveness. The chief stars are:-

			Mag.	1			Mag.
•	•••		 2·I		π	 	3.1
σ		•••	 2.3		φ	 	3.3
δ		•••	 2.8		ξ ²	 	3.5
5			 2.9		7	 	3.5
72			 3.0		β¹	 	3.8
η			 3.0		0	 	3.9
λ			 3.1	1	ρ^1	 	3.9

There are also 34 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
Telego.					h. m.	0 ,	
I		3	6008	2972	17 40.0	- 27 47	4.9
2			6016	A 170	17 41.3	- 31 39	5.2
3			6074	A 14	17 51.4	- 30 14	5.4
4		4	6077	3006	17 52.5	- 23 48	4.6
5	γ¹		6107	3035	17 57.4	- 29 35	4.9
6	γ2	10	6115	3036	17 58.1	- 30 25	3.0
7			6127	3039	18 0.2	— 28 28	4.7
8	μ	13	6168	3062	18 6.6	- 2I 5	4.1
9	η		6186	3074	18 9.5	- 36 48	3.0
10			6194	3076	18 10.2	- 27 5	4.7
1			STATE OF				
11	δ	19	6209	3084	18 13.3	- 29 53	2.8
12	€	20	6233	3095	18 16.2	- 34 26	2·I

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude Harv. or Arg.: Oxford.
					h. m.	0,	
13		21	6247	3105	18 18.2	- 20 36	4'9
14	λ	22	6263	3111	18 20.6	- 25 29	3.1
15			6279	3119	18 22.4	- 14 39	4.7
16			6294	3124	18 24.4	- 18 29	5.3
17	φ	27	6371	3157	18 38.3	- 27 7	3.3
18	ν1	32	6434	3196	18 46.9	- 22 53	5.0
19		•••		3198	18 47.8	- 15 45	5.1
20	σ	34	6440	3199	18 47.8	- 26 27	2.3
21	ν	35	6441	3200	18 47'9	- 22 49	5.3
22	ξ ¹	36	6454	3213	18 50.3	- 20 49	5.0
23	ξ ²	37	6461	3218	18 50.6	-21 16	3°5
24	5	38	6489	3237	18 55.0	-30 3	5.9
25	0	39	6507	3252	18 57.5	- 21 55	3.9
26	7	40	6	22.8	.0		
BY TO THE		40	6521	3258	18 59.5	- 27 51	3.2
27	Ψ	41	6548	3270	19 8.5	-21 13	3.1
29	$\begin{vmatrix} \phi \\ d \end{vmatrix}$	42	6575	3287	ANY MAINTING	- 25 28	5.5
30	β^1	43	6584	3296 A 168	19 10.6	- 19 10	4'9
30	-		0008	A 100	19 14.0	-44 4I	3.8
31	β^2		6610	A 172	19 14.5	-45 ²	4'4
32	ρ^1	44	6619	3319	19 14.7	-18 4	3.9
33	v	46	6621	3321	19 14.8	-16 11	4.7
34	a		6622	A 177	19 15.6	-40 5I	4.0
35	x	47	6633	3331	10 18.0	- 24 44	5.1
	100		00				
36		.,.	6689	A 64 Telesc.	19 26.3	-48 21	5'4
37	h^2	52	6706	3373	19 29'4	-25 9	4.6
38	e^2	55	6742	3403	19 35'7	- 16 24	5.0
39	f	56	6760	3414	19 39.4	- 20 3	5.1
40	ı		6812	A 241	19 47.0	-42 11	4'3
		2			128		
41	ω	58	6823	3446	19 48.5	— 26 37	5.0
42	b	59	6832	3451	19 49.6	- 27 29	4.7
43	9	61	6840	3456	19 21.1	— 15 49	5.0
		Carl III		Contract State	DA WEAL	AR THE PARTY	

No.	Letter.	Flam- steed.	B,A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
	•		- GARAGE		h. m.	0 ,	
44	A	60	6842	3459	19 51.6	- 26 31	5.0
45			6843	3461	19 51.9	- 35 36	4.5
46	c	62	6870	3477	19 55'3	- 28 3	4.7
47			6872	A 268	19 55.5	-38 16	5.0
48			6877	3484	19 56.7	- 32 23	2.1

Fl. 7 (5·4); B.A.C. 6161 (5·3); Lac. 7746 (5·8); Lac. 7761 (5·6); Lac. 7830 (5·2); Fl. 29 (5·5); H.P. 3226 (5·3); B.A.C. 6499 (5·5); B.A.C. 6536 (5·5); Lac. 8037 (5·9); Fl. 50 (5·5); B.A.C. 6746 (5·5); Lac. 8239 (5·6); Lac. 8285 (5·9); Lac. 8296 (5·9); Lac. 8362 (5·7); Lac. 8415 (5·5); Lac. 8417 (5·6).

71. SCORPIO.

Fr. Le Scorpion; Germ. Der Scorpion.

				R.A.	Decl.
				h. m.	0
Meridional Cent	16 20	-26			
	/ Preceding	•••		15 30	
Approximate Boundaries.	Following			17 55	
	North	•••			- 7
1900.	South				-45

Scorpio is also a much richer and more important constellation than many persons imagine. Besides its leading star Antares there are no fewer than 15 of its stars brighter than mag. 3.9. These are:—

		Mag.				Mag.
a (Antares)		1.1	T		 	2.9
λ		1.7	σ		 Z	3.0
θ		2.1	π		 	3.1
€		2.2	t1		 	3.3
δ	• • • •	2.5	μ^1		 	3.6
κ		2.6	\ \csi^2	•••	 ****	3.6
υ		2.8	η		 	3.6
β¹		2.9	μ^2		 	3.9

On the other hand, its stars of mags. 4-5.2 are disproportionately few, for there are only 16 of them.

-								
ı	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
-								or Arg Oxford.
						h. m.	0 /	
	1	b	1	5232	2640	15 43.8	- 25 23	4.8
ı	2	A	2	5250	2651	15 46.4	- 24 58	4.7
	3	ρ	5	5272	2662	15 49'5	- 28 52	4'0
ŀ	4	π	6	5289	2671	15 51.6	- 25 46	3.1
ł	5	δ	7	5303	2674	15 53.2	- 22 17	2.2
ı	,			THE PARTY OF	2600 0	7	** **	4.1 {5.0}
ı	6	\$	51	5324	2688-9	15 57.7	- II I2	4114.75
t	7	β^1	.8	5329	2690-1	15 58.5	- 19 29	2.9 {5.2 }
1	8	ω1	9	5337.	2698	15 59.8	- 29 21	4.1
1	9	ω^2	10	5242	2700	16 0.4	- 20 33	4.6
	IO.			5374	2709	16 3.6	- 20 6	5.1
ı								
ı	11	c^2	13	5381	2711	16 4.9	- 27 37	4.7
۱	12	ν	14	5382	2714	16 5.0	-19 9	4.5
ı	13	4	15	5386	2715	16 5.4	- 9 45	4.8
ı	14			5429	2732	16 10.0	- 28 19	5.0
ı	15		19	5445	2737	16 13.4	- 23 53	4.7
ı					200	16 1210	25.18	2:0
١	16	σ	20	5447	2738	16 13.9	- 25 18	3.0
۱	17	a	21	5498	2764	16 22.1	- 26 10	
ı	18		22	5501	2769	16 22.9	- 24 51	4.6
ı	19			5508	A 72	16 23.5	- 34 27	4.6
ı	20	7	23	5539	2783	16 28.4	- 27 58	3.0
۱	W.E.	2015h			A 76	16 28.5	- 35 I	4.4
1	21	1 "	26	5538	2818	16 42.4	- 34 5	2.5
1	22	€1	26	5632	THE RESERVE	16 43.8	- 34 5 - 37 50	3.6
	23	μ^1		5638	A 98	16 44.2		3.9
	24	μ2		5640	A 99		- 37 49 - 42 0	3.6
	25	ζ2		5661	A 104	16 46.1	-42 9	30
	26	No.		5735	A 120	16 56.9	- 33 57	5.2
		27		5778	A 126	17 3.6	-43 5	3.6
	27 28	υ			2924	17 22.6	- 37 12	2.8
1			34	5901	A THAT IS	17 25.5	-37 I	1.7
1	29	λ	35	5915	2932	17 28.3	- 38 32	4.7
-	30		•••	5932	A 159	1/ 203	30 32	
1	21	0		5935	A 160	17 28.7	-42 55	2.1
-	31	K		5970	A 165	17 34.2	- 38 58	2.6
3	32			3970	12205			

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford	
	77.72		1		h. m.	0 ,		
33	41		6004	A 169	17 39.2	-40 5	3'3	
34			6055	A 181	17 48.0	-44 19	5.4	
35			6061	A 183	17 49'3	-41 41	5.3	

B.A.C. 5254 (5.4); Fl. 4 (5.5); B.A.C. 5286 (5.4); B.A.C. 5314 (5.4); Fl. 12 (5.5); Fl. 16 (5.5); B.A.C. 5435 (5.4); χ (5.6); Lac. 6810 (5.8); Lac. 6816 (5.7); B.A.C. 5464 (5.4); Lac. 6854 (5.9); Lac. 6859 (4.6); Lac. 6949 (5.9); Lac. 7000 (5.9); Lac. 7016 (5.8); Lac. 7089 (5.7); B.A.C. 5718 (5.3); Lac. 7147 (5.7); Lac. 7159 (5.9); Lac. 7179 (5.8); Lac. 7202 (5.9); Lac. 7247 (5.8); Brisb. 6125 (5.8); ι^2 (5.6).

72. APPARATUS SCULPTORIS (SCULPTOR).

Fr. L'Atelier du Sculpteur; Germ. Die Bildhauerwerkstätte.

			R.A.	Decl.
	15 32		h. m.	0
Meridional Cent	0 30	-35		
	Preceding .	 	23 0	
Approximate	Following .	 	1 40	
Boundaries,	North	 		- 27
1900.	South .	 		-42

The constellation Apparatus Sculptoris is now universally called "Sculptor," the tools being discarded and their owner raised to the place of dignity.

The brightest star, a, is only of mag. 4·1. There are 10 stars between that and the $5\frac{1}{2}$ limit.

No.	Letter.	Flam- steed,	B,A.C,	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg.: Oxford.
					h. m.	0 ,	
I	γ		8113	4121	23 12.3	- 33 11	4.6
2	β.		8201	A 16	23 26.5	- 38 19	4.8
3	μ		8236	A 23	23 34'3	- 32 44	5.2
4	δ		8275	4205	23 42.7	- 28 48	4.6
5	5		8352	4248	23 56.2	- 30 23	5.0
		10		F. 15. 15.			
6			10	II	0 3.5	- 28 39	5.5
7			23	18	0 5.2	- 28 28	5.2
. 8	θ		24	A 53	0 5.6	- 35 48	5.4

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 ,	
9			72	50	0 15.5	-29 39	5.2
10	•••		103	62	0 22.0	- 33 40	4.8
11	a		272	158	0 52.8	-30 0	4.1
12	€		541	274	1 40.0	- 25 39	5.5

Lac. 9675 (5.8); Lac. 9735 (5.7); Lac. 22 (5.9); Lac. 125 (5.8); λ^2 (5.8); σ (5.6); Lac. 447 (5.8); Lac. 462 (5.9); Lac. 500 (5.6); Lac. 501 (5.9).

73. SCUTUM SOBIESKII.

Fr. L'Écu de Sobieski; Germ. Der Sobieskische Schild.

				R.A.	Decl.				
				h. m.	0				
Meridional Cent	Meridional Centre of Constellation								
Approximate Boundaries,	Preceding			18 0					
	Following			18 55					
	North				- 3				
1900.	South				-15				

This constellation is sometimes called Clypeus Sobieskii, but Scutum simply is now its more usual designation. Its brightest star is B.A.C. 6325, of mag. 4. There are 5 other stars between that and mag. 5.2. Nos. 2—6, below, are assigned to Aquila in B.A.C.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. Decl. 1880.		Magnitude, Harv. or Arg. : Oxford.		
			Sala =		h. m.	0 /			
1				3102	18 17.1	- 9 0	2.0 : 2.1	1	
2		S	6325	3134	18 28.7	- 8 20	4.0 : 4.5	2	
3		2	6361	3151	18 35.7	- 9 10	4.8 : 5.0	2	
4		3	6367	3154	18 37.0	- 8 25	5.1 : 2.5	2	
5		6	6388	3174	18 40.8	— 4 53	4.4 : 4.5	5	
6		9	6464	3219	18 50.7	- 6 0	5.1 : 5.0	5	

74. SERPENS.

Fr. Le Serpent; Germ. Die Schlange.

	14 O (0)		R.A.	Decl.
			h. m.	0
Meridional Cen	 15 35	+ 8		
A	Preceding		 15 0	
Approximate Boundaries.	Following		 16 15	
	North			+ 23
1900.	South		 1900年1900	- 4

Serpens is a long rambling constellation much mixed up with Ophiuchus, whence the name Serpentarius (= serpent-bearer) sometimes applied to Ophiuchus. The chief stars are:—

		Mag.			Mag.
a .	 	2.7	€ .	 	 3.7
		3.4	€.	 	 3.7
		3.5			

There are 19 stars of mags. 4-5.2.

No.	Letter.	Flam- steed,	B,A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
253	1 2 3				h. m.	0 ,	
I		5	5047	2544	15 13.2	+ 2 13	5.1 : 5.1
2		10	5095	2571	15 22.6	+ 2 16	5.1 : 5.3
3	δ	13	5135	2590	15 29.1	+ 10 57	4.0 : 3.8
4	X	20	5185	2620	15 36.1	+ 13 14	5.1 : 2.0
5	1	21	5187	2621	15 36.2	+ 20 3	4.6 : 4.6
	145.15						
6	a	24	5196	2627	15 38.4	+ 6 48	2.7 : 2.7
7	β	28	5216	2632	15 40.6	+ 15 48	3.8 : 3.2
8	λ	27	5214	2633	15 40.6	+ 7 44	4.4 : 4.7
9	к	35	5234	2636	15 43.3	+ 18 31	4.5 : 3.9
10	μ	32	5230	2638	15 43.4	- 3 4	3.2 : 3.3
		7 4 5		70 S			
11	ω	34	5238	2641	15 44.2	+ 2 33	5.5 : 2.0
12	€	37	5245	2645	15 44.8	+ 4 50	3.7 : 3.6
13	b	36	5246	2646	15 45.0	- 2 44	5.3 : 2.3
14	ρ	38	5252	2649	15 46.0	+ 21 20	4.8 : 5.0
15	γ	41	5284	2666	15 50.9	+ 16 3	4.0 : 3.8

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv, or Arg.: Oxford.
					h. m.	0 ,	
16	π	44	5322	2687	15 57.1	+23 8	5.0 : 4.2
17	σ	50	5456	2744	16 16.0	+ 1 19	4.8 : 4.9
18	ν	53	5845	2897	17 14.1	- 12 43	4.4 : 4.3
19	\$	55	5949	2947	17 30.7	- 15 19	3.7 : 3.3
20	0	56	5976	2956	17 34.7	- 12 49	4.4 : 4.3
21	5	57	6085	3013	17 54.2	- 3 41	4.5 : 4.5
22	η	58	6229	3090	18 15.1	- 2 56	3.4 : 3.6
23	d	59	6269	3112	18 21.1	+ 0 8	5.2 : 5.5
24	θ^1	63	6460	3215	18 50.2	+ 4 3	4.7 : 3.9
25	θ^2	1	6462	3216.	18 50.3	+ 4 3	5.1 : 4.2

F1. 3 (5·4); F1. 4 (5·4); F1. 6 (5·5); τ^1 (5·5); F1. 16 (5·3); Λ^2 (5·4); F1. 30 (5·5); ϕ (5·4); σ (5·5); ψ (5·6); τ^8 (5·7); σ (5·7).

75. SEXTANS.

Fr. Le Sextant; Germ. Der Sextant.

			R.A.	Decl.	
			h. m.	0	
Meridional Cen	10 10	- I			
	Preceding	 	9 30		
Approximate	Following	 	10 40		
Boundaries,	North	 	William Control	+ 8	
1900.	South	 		- 9	

Sextans is an insignificant constellation, of which no star is brighter than mag. 4.5, and only 4 others are above the 5.2 limit.

No.	Letter.	Flam- steed,	B,A,C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
					h. m.	0 ,	
I		1	3286	1726	9 30.9	+ 7 22	2.0 : 2.1
2		2	3295	1732	9 32.2	+ 5 11	4.8 : 4.6
3		15	3458	1796	10 1.8	+ 0 13	4.2 : 4.9
4		29	3590	1846	10 23.4	- 2 8	5.3 : 2.1
5		30	3597	1850	10 24.3	- o I	4.9 : 5.0

76. TAURUS.

Fr. Le Taureau ; Germ. Der Stier.

				R.A.	Decl.
			10 26	h. m.	0
Meridional Cen	4 30	+ 18			
Approximate	Preceding	 		3 15	
**	Following	 	38	5 45	
Boundaries,	North	 			+ 30
1900.	South	 			+ 0

Taurus is a large and interesting constellation, comprising naked-eye and telescopic objects in great variety. The former include the 2 historically celebrated groups of the Pleiades and Hyades, and the beautiful star Aldebaran. The principal stars are:—

		Mag.			Mag.
a (Aldebar	an)	1.0	0	•••	 3.8
β		1.9	£		 3.8
η		3.0	Fl. 17		 3.8
\$		3.0	Fl. 27		 3.8
λ		3.6	γ		 3.9
θ^2		3.6	θ¹		 3.9
£		3.7			

There are no fewer than 46 stars of mags. 4-5.2.

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
UTVATE			Actions	11812	h. m.	0 1	William Selection
I	0	1	1057	550	3 18.4	+ 8 36	3.8 : 3.6
2	1	2	1068	554	3 20.7	+ 9 19	3.8 : 3.7
3	8	4	1084	563	3 23.8	+ 10 56	5'1 : 5'3
4	f	5	1087	567	3 24.2	+ 12 31	4'3 : 4'1
5		10	1112	581	3 30.8	+ 0 1	4.4 : 4.2
6		17	1147	608	3 37.8	+ 23 44	3.8 : 4.0
7	1	19	1151	610	3 38.1	+ 24 5	4.4 : 4.5
8		20	1154	613	3 38.7	+24 0	4.0 : 4.0
9		23	1161	615	3 39.2	+ 23 34	4.3
10	η	25	1166	618	3 40.4	+ 23 44	3.0 : 3.1

-								
	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford. or Arg.
-			TA AL		In []]	h. m.	0 /	
ı	11	e	30	1174	622	3 41.7	+ 10 46	5.1 : 2.1
ı	12	25.17	27	1176	625	3 42.0	+ 23 41	3.8 : 4.0
1	13	λ	35	1241	657	3 54.0	+ 12 9	3.6 : 3.4
ı	14	ν	38	1251	665	3 56.8	+ 5 39	40 : 41
ı	15	. A1	37	1257	670	3 57.6	+ 21 45	4.4 : 4.8
ı	16	¥	42	1265	680	3 59.6	+ 28 41	5.5 : 2.3
ı	17		47	1298	712	4 7.4	+ 8 58	5.0 : 2.1
ı	18				713	4 8.1	+ 9 42	5.0 : 5:3
1	19	μ	49	1304	716	4 9.0	+ 8 36	4.3 : 4.3
	20	ω^2	50	1311	722	4 10.3	+ 20 17	4.6 : 2.1
	21	φ	52	1326	736	4 13.0	+ 27 4	5.1 : 2.5
ı	22	1 7	54	1328	737	4 13.0	+ 15 20	3.9 : 3.5
ı	23		58	1332	742	4 13.8	+ 14 48	5.1
١	24	δ1	61	1346	750	4 16.0	+ 17 15	4.0 : 3.9
١	25	δ^2	64	1356	756	4 17.2	+ 17 10	4.7 : 5.0
	26	r	66	1357	757	4 17.3	+ 9 11	5.1 : 2.3
	27	к	65	1362	760	4 18.3	+22 2	4.6 : 4.6
1	28	δ3	68	1365	763	4 18.6	+ 17 39	4'2 : 4'5
	29	v^1	69	1367	764	4 19.1	+ 22 32	5.3 : 4.6
1	30		71.	1369	765	4 19.5	+ 15 20	4.6 : 5.0
1	31	π	73	1370	768	4 19.8	+ 14 26	4.9 : 2.1
1	32	•	74	1376	773	4 21.6	+ 18 55	3.7 : 3.7
1	33	θ^1	77	1380	775	4 21.7	+ 15 42	3.9 : 4.1
1	34	θ^2	78	1381	776	4 21.8	+ 15 36	3.6 : 3.6
	35	b	79	1384	777	4 22.1	+ 12 47	5.5 : 2.1
1	36			1391	783	4 23.7	+ 15 56	4.9 : 2.1
	37	P	86	1409	789	4 26.7	+ 14 35	4.8 : .5.0
	38	a	87	1420	797	4 29.0	+ 16 16	1.0 : 1.1
	39	d	88	1421	798	4 29.1	+ 9 55	4.6 : 4.5
M	40	c1	90	1434	805	4 31.2	+ 12 16	4.3 : 4.6
	41	σ^1	91	1436	807	4 32.3	+ 15 33	5.1 : 2.3
	42	σ^2	92	1437	808	4 32.4	+ 15 42	4.8 : 5.1
-	43	τ	94	1449	819	4 35.0	+ 22 44	4.4 : 4.6
13	44	i	97	1493	842	4 44'3	+ 18 39	5.1 : 2.5
	45		102	1551	888	4 55'9	+ 21 25	4.7 : 4.9

No.	Letter.	Flam-steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. oxford
		STATE OF		-4-1	h. m.	0 /	
46	m	104	1568	900	5 0.3	+ 18 30	2.1 : 2.3
47	n	109	1637	950	5 12.1	+ 21 59	5.2 : 5.4
48		111	1671	970	5 17.4	+17 17	5.3 : 2.3
49	β	112	1681	978	5 18.7	+ 28 30	1.9 : 1.8
50	0	114	1695	987	5 20.4	+ 21 50	4.8 : 5.1
51		119	1726	1003	5 25.2	+ 18 30	4.6 : 4.6
52	5	123	1767	1032	5 30.5	+21 4	3.0 : 3.0
53		125	1778	1037	5 32'3	+ 25 50	4.9 : 5.1
54		126	1792	1044	5 34'4	+ 16 29	4.9 : 2.1
55		133	1834	1064	5 40.9	+ 13 52	5.3 : 2.3
56		132	1837	1067	5 41.7	+ 24 33	5.1 : 2.3
57		134	1846	1071	5 42.8	+ 12 37	4.8 : 5.0
58		136	1863	1084	5 45.8	+ 27 36	4.5 : 4.7
59		139	1896	1099	5 50.6	+ 25 56	2.1 : 2.0

t (5·5); Fl. 13 (5·4); B.A.C. 1192 (5·5); Fl. 40 (5·3); H.P. 672 (5·5); Fl. 41 (5·4); Fl. 46 (5·3); Fl. 51 (5·4); Fl. 53 (5·5); Fl. 56 (5·4); χ (5·5); Fl. 67 (5·5); Fl. 72 (5·4); Fl. 75 (5·3); Fl. 81 (5·5); Fl. 83 (5·4); H.P. 810 (5·5); Fl. 93 (5·3); l (5·4); Fl. 103 (5·5); Fl. 115 (5·4); Fl. 116 (5·5); Fl. 118 (5·4); B.A.C. 1728 (5·5); Fl. 120 (5·3); Fl. 121 (5·4); Fl. 122 (5·4); Fl. 130 (5·5).

77. TELESCOPIUM.

Fr. Le Télescope ; Germ. Das Teleskop.

			R.A.	Decl.
			h. m.	0
Meridional Cen	tre of Constellation	n	 18 40	-52
	Preceding		 17 40	
Approximate	Following		 19 30	
Boundaries,	North			-46
1900.	South			-60

Telescopium is a small Southern constellation, the brightest star of which is a of mag. 3.5. There are 5 other stars between that and mag. $5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B,A,C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. oxford.
SEA P					h. m.	0 ,	
I	€		6140	A 3	18 2.3	-45 58	5.5
2	a		6240	A 13	18 18.1	-46 2	3.2
3	5		6250	A 14	18 19.6	-49 8	4.2
4	λ		6443	A 41	18 48.8	-53 5	5°2
5	••		6592	A 55	19 13.1	- 54 38	5'4
6	ν		6751	A 67	19 38.2	- 56 38	5.5

Lac. 7608 (5.7); δ^1 (5.7); δ^2 (5.7); κ (5.7); Lac. 7872 (5.9); ρ (5.7); Lac. 8091 (5.9).

78. TOUCAN.

Fr. Le Toucan; Germ. Der Tucan.

				R.A.	Decl.
35 11 10				h. m.	0
Meridional Cen	tre of Constella	ation	 	23 45	-68
Approximate	/ Preceding		 	22 0	
Boundaries,	Following		 	1 30	
	North		 		-57
1900.	South		 		-76

This constellation comprises only one bright star, α , of mag. 2.8, together with 11 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. Oxford.
				THE PLANT	h. m.	0 /	
1	α		7767	A 2	22 10.3	- 60 51	2.8
2	δ		7808	A 6	22 18.8	-65 35	4.8
3	ν		7841	A 8	22 24.9	-62 36	5.2
4	γ		8098	A 26	23 10.4	- 58 54	4.0
5	η		8323	A 43	23 51.3	- 64 58	5'3
		A Va					
6	€		8334	A 44	23 53.7	-66 15	4'3
7	5		64	A 49	0 13.8	-65 34	4'1
8	β^1		127	A 52	0 26.0	-63 37	4'3
9	β^2		128	A 53	0 26.1	-63 38	4'7
10			134	A 54	0 27.2	-63 42	5.2

No.	Letter.	Flam- steed.	B,A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
			8.75	17742	h. m.	0,	REFERENCES.
11	λ^2		266	A 70	0 50.5	-70 10	5.2
12	к		392	A 78	1 11.7	-69 31	5.1

Lac. 9112 (5·7); Lac. 9412 (5·7); Lac. 9463 (5·7); Lac. 9474 (5·7); Lac. 9483 (5·8); Lac. 9710 (5·9); π (5·7); ρ (5·7); ι (5·6).

79. TRIANGULUM.

Fr. Le Triangle; Germ. Das Dreieck.

			R.A.	Decl.
Maridianal Con	tre of Constellation			0
mendional cen		 	2 0	+ 32
Ammonimato	Preceding	 	I 30	
Approximate	Following	 	2 30	
Boundaries,	North	 		+ 37
1900.	South	 		+ 26

Triangulum is one of the ancient constellations, notwithstanding its small size. Its principal stars are:—

			Mag.
β	•••	 	 3.1
a		 	 3.6

There are 3 stars between mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880,	Magnitude, Harv. or Arg. : Oxford.		
644.0		The Will	BE ET D		h. m.	0 ,			
1	a	2	569	289	1 46.3	+ 29 0	3.6 : 3.2		
2	β	4	656	336	2 2.4	+ 34 25	3.1 : 3.1		
3		7	691	356	2 8.8	+ 32 49	5.2 : 5.3		
4	δ	8	697	360	2 9.9	+ 33 42	5.0 : 2.3		
5	γ	9	698	361	2 10.3	+ 33 17	4.5 : 4.3		

B.A.C. 516(5.4); $\epsilon(5.4)$; Fl. 6(5.3); Fl. 10(5.3); Fl. 12(5.5); Fl. 14(5.3); H.P. 398(5.5).

80. TRIANGULUM AUSTRALE.

Fr. Le Triangle Austral; Das Südliche Dreieck.

			R.A.	Decl.
			h. m.	0
Meridional Cen	15 40	-65		
Approximate	Preceding	 	14 40	
Boundaries.	Following	 00	16 40	
1000.	North	 		-59
1900.	South	 		-72

The Southern Triangle is, like its Northern namesake, a small constellation, but it contains several bright stars:—

			Mag.
a	•••	 	 2.2
γ		 	 3.1
β		 	 3.1

There are also 2 stars of mags. 4.3 and 4.6 respectively, but all the others are below $5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
A TOTAL	No.				h. m.	0 , .	
1	γ		5005	A 5	15 7.7	-68 16	3.1
2	€		5103	AII	15 25.8	- 65 55	4.6
3	β		5233	A 17	15 54.6	-63 3	3.1
4	δ		5375	A 25	16 4.5	-63 23	4.3
5	a		5578	A 42	16 36.0	- 68 48	2.5
		III III	Selection of		FLAT AND AND AND ADDRESS OF THE PARTY OF THE	ACRE OF SALE	

к (5.7); \$ (5.6); ι (5.8); Lac. 6809 (5.9); Lac. 6906 (5.6).

81. URSA MAJOR.

Fr. La Grande Ourse; Germ. Der Grosse Bär.

				R.A	n.	Decl.
Meridional Cent	on		11	0	+ 58	
	Preceding			8	0	
Approximate	Following		44.4	14	0	
Boundaries,	North					+75
1900.	South		•••			+ 30

Ursa Major, though certainly not on the whole so rich or so beautiful a constellation as Orion, is probably more generally

known to all classes by reason of its perpetual visibility in England. Its chief stars are:-

		Mag.	1			Mag.
€ (Alioth)		1.8	13 55	θ	 	 3.2
a (Dubhe)		2.0		0	 	 3.4
η(Alkaid orBer	netnasc	h)2.0	13 252	δ	 	 3.4
ζ (Mizar)		2.4		λ	 	 3.6
β		2.6		к	 	 3.7
γ		2.6		h	 	 3.7
μ		3.1		Ė	 	 3.8
ψ		3.1	HI VI	ν	 	 3.8
·		3.1		x	 	 3.9

There are 27 stars of mags. 4-5.2.

Ī	No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880,	Magnitude, Harv. or Arg. : Oxford
1	100		TESSY		&=12.00 E	h. m.	0 /	perfect settle
ı	I	0	1	2819	1558	8 20.3	+61 8	3'4 : 3'4
1	2	π^2	4	2884	1584	8 29.7	+ 64 46	4.8 : 4.7
ı	3	ı	9	3048	1636	8 51.0	+48 31	3.5 : 3.5
ı	4	ρ	8	3049	1638	8 51.7	+68 6	5.0 : 2.0
ı	5	к	I 2	3075	1645	8 55'4	+47 48	3.7 : 3.6
ı					A STATE OF			
ı	6	σ	13	3099	1655	8 59.8	+67 37	4.8 : 5.0
ı	7	f	15	3106	1656	9 0.4	+ 52 5	4.4 : 4.7
ı	8	τ	14	3108	1658	9 1.0	+64 0	4.8 : 4.9
ı	9	c	16	3125	1669	9 4'9	+61 55	2.5 : 2.1
ı	IO	e	18	3140	1675	9 7.6	+ 54 31	4.9 : 2.0
١			4					
1	11	h	23	3221	1701	9 22.1	+63 35	3.7 : 3.7
4	12	d	24	3232	1706	9 23.9	+ 70 21	4.6 : 4.9
ı	13	θ	25	3242	1709	9 24.8	+ 52 13	3.5 : 3.1 ,
ı	14		26	3256	1715	9 26.6	+ 52 36	4.6 : 4.7
ı	15	υ	29	3346	1753	9 42.2	+ 59 36	4.0 : 3.9
1		1						
1	16	φ	30	3358	1756	9 44.0	+ 54 38	4.4 : 4.7
	17	λ	33	3505	1810	10 9.9	+43 31	3.6 : 3.2
	18	μ	34	3533	1827	10 15.2	+42 6	3.1 : 3.1
1	19			3531	1829	10 15.2	+ 66 11	2.0 : 2.0
	20		36	3580	1844	10 23.0	+ 56 36	4.9 : 2.0
			Late					R. P. C. C.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg. : Oxford.
					h. m.	0 ,	
21		•••	3607	1857	10 26-2	+41 3	5.1 : 5.1
22		37	3612	1861	10 27.4	+ 57 42	5.3 : 2.4
23		38	3647	1877	10 33.8	+ 66 20	5.0 : 5.0
24			3652	1878	10 34.5	+69 42	5.3 : 2.0
25	ω	45	3729	1903	10 47.1	+43 50	4.9 : 4.9
06		.6	0 111			T Chicago	
26		46	3741	1907	10 49.1	+ 34 9	5°2
27	0	47	3757	1913	10 52.8	+41 4	5.5 : 2.5
28	β	48	3767	1923	10 54.6	+ 57 1	3.6 : 3.3
29	a	50	3777	1926	10 56.3	+ 62 24	5.0 : 1.9
30	Ψ	52	3812	1941	11 5.0	+ 45 9	3.1 : 3.5
31	1	5.3	3851	1959-60	11 11.8	+ 32 18	3.8 4.8 3.7
32	ν	54	3852	1961	11 12.0	+ 33 45	3.8 \\ 4.3 \\ 3.8 \\ 3.8 \\ 3.5 \\ 3.8 \\ 3.5 \\ 3.5 \\ 3.5 \\ 3.5 \\ 3.6 \\ 3.6 \\ 3.7 \\ 3.8 \\ 3.8 \\ 3.7 \\ 3.8
33		55	3856	1962	11 12.6	+ 38 51	4.8 : 4.9
34		56	3868	1967	11 16.3	+44 9	2.1 : 2.3
35		57	3905	1980	11 22.6	+40 0	2.5 : 2.1
0.5			0)-3	3.0		1 40	3 3-
36	X	63	3981	2018	11 39.7	+ 48 27	3.9 : 3.8
37	γ	64	4017	2036	11 47'5	+ 54 22	2.6 : 2.3
38		67	4057	2054	11 56.0	+ 43 43	5.1 : 2.1
39	δ	69	4123	2077	12 9.5	+ 57 42	3.4 : 3.4
40	€	77	4335	2191	12 48.7	+ 56 37	1.8 : 1.8
130							
41		78	4366	2207	12 55.6	+ 57 1	4.8. : 5.0
42	5	79	4484	2264-5	13 10.1	+ 55 33	24 4.2 5
43	9	80	4493	2267	13 20.4	+ 55 37	4.5 : 4.0
44		8,3	4568	2315	13 36.5	+ 55 17	4.8 : 5.1
45	η	85	4607	2338	13 42.8	+ 49 55	5.0 : 1.8

A $(5\cdot3)$; σ^1 $(5\cdot3)$; B.A.C. 3150 $(5\cdot5)$; Fl. 27 $(5\cdot5)$; Fl. 31 $(5\cdot3)$; B.A.C. 3665 $(5\cdot3)$; Fl. 44 $(5\cdot4)$; Fl. 49 $(5\cdot4)$; Fl. 59 $(5\cdot5)$; B.A.C. 3985 $(5\cdot3)$; B.A.C. 4510 $(5\cdot4)$; Fl. 81 $(5\cdot5)$; Fl. 82 $(5\cdot3)$; Fl. 86 $(5\cdot5)$; B.A.C. 5058 $(5\cdot5)$.

^{**} The star numbered above as 26 (Fl. 46) is assigned by B.A.C. to Leo Minor, but as it is numbered in Baily's edition of Flamsteed in Ursa Major I have thought it best to do the same.

82. URSA MINOR.

Fr. La petite Ourse; Germ. Der Kleine Bär.

			R.A.	Decl.
			h. m.	0
Meridional Cent	15 40	+78		
Approximate	Preceding	 	13 0	
Boundaries,	Following	 	18 0	
	North	 		+90
1900.	South	 		+65

Ursa Minor is often regarded as a sort of counterpart of Ursa Major, but the resemblance is rather far-fetched. The real importance of this constellation arises from the fact that the North Pole and the Pole Star are within its boundaries. Its chief stars are:-

		Mag.
β (Kochab)	 	 2·I
a (Polaris)	 	 2.2
γ	 	 3.2

There are 11 stars of mags. 4-5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
					h. m.	0 /	
1		2	262	155	0 52.6	+85 37	4.2
2	a	I	360	213	1 14.6	+ 88 40	2.3 : 5.0
3			4339	2188	12 48.1	+84 4	,
4			4342	2189	12 48.3	+84 4	\$ 5.0
5		4	4733	2396	14 9.3	+ 78 7	4.9 : 5.0
6		5	4822	2437	14 27.8	+ 76 14	4'3 : 4'7
7	β	7	4936	2500	14 51.1	+ 74 39	5.1 : 5.5
8		11	5079	2555	15 17.2	+ 72 15	5.1
9	Y	. 13	5094	2566	15 20.9	+ 72 16	3.5 : 3.0
10	θ	15	5191	2616	15 35.0	+77 45	5.3 : 2.0
11	5	16	5285	2657	15 48.4	+ 78 10	4.5 : 4.6
12	η	21	5511	2759	16 21.0	+ 76 2	2.0 : 2.1
13	E	22	5780	2851	16 58.3	+82 14	4.5 : 4.5
14	δ	23	6281	3077	18 11.0	+86 37	4.3 : 4.2

BA.C. 4732 (5.3); Fl. 11 (5.3); Fl. 19 (5.5); B.A.C. 5592 (5.5).

83. VIRGO.

Fr. La Vierge; Germ. Die Jungfrau.

			R.A.	Decl.
			h. m.	0
Meridional Cen	13 20	- 2		
Approximate	Preceding	 	11 35	
Boundaries,	Following	 	15 0	
	North	 		+ 15
1900.	South	 		-20

Virgo is a constellation marked by a fair number of bright stars, including one very bright one (Spica), but astronomically Virgo is chiefly noted for its large number of nebulæ. The chief stars are:—

	Mag.		Mag.
a (Spica)	1.2	β	 3.7
γ	2.8	δ	 3.7
ε (Vindemiatrix)	3.0	Fl. 109	 3.7
\$	3.5	μ	 3.9

There are 30 stars of mags. 4.4-5.2.

No.	Letter.	Flam- steed,	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude. Harv. : Oxford.
		10		15107	h. m.	0 /	
1	\$	2	3979	2017	11 39.1	+ 8 55	4.9 : 5.2
2	ν	3	3982	2019	11 39.7	+ 7 12	4'2 : 4'3
3	A ¹	4	3989	2023	11 41.8	+ 8 55	5.3 : 2.3
4	β	5	4002	2028	11 44.4	+ 2 27	3.7 : 3.4
5	b	7	4049	2049	11 53.8	+ 4 20	5'2 : 5'4
6	π	8	4052	2051	11 54.7	+ 7 17	4.4 : 4.6
7	0	9	4072	2057	11 59.1	+ 9 24	4'3 : 4'3
8	η	15	4145	2088	12 13.8	0 0	4.0 : 3.8
9	c	16	4151	2090	12 14.3	+ 3 59	5.3 : 2.3
10	x	26	4257	2150	12 33.1	- 7 20	4.7 : 4.7
11	γ	29	4268	2155-6	12 35.6	- 0 47	2.8 \ \ \ 3.5 \ \ 3.5 \ \ 2.7
12	P	30	4271	2157	12 35.8	+ 10 54	5.1 : 4.9
13	¥	40	4330	2186	12 48.1	- 8 53	2.0 : 2.I
14	δ	43	4340	2193	12 49.6	+ 4 3	3.7 : 3.5
15	€	47	4367	2208	12 56.2	+ 11 36	3.0 : 3.0

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent. Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. : Oxford.
TOTAL SE					h. m.	0 ,	
16	g	49	4391	2219	13 1.6	— IO 6.	5.2
17	θ	51	4401	2224	13 3.7	- 4 54	4.4 : 4.2
18		53-	4418	2231	13 5.7	- 15 33	5·I
19	e	59	4440	2244	13 10.8	+10 5	5.1 : 2.5
20	σ	60	4446	2246	• 13 11.5	+ 6 6	5.0 : 2.1
21		61	4449	2247	13 12.1	- 17 38	4.8
22	a	67	4480	2263	13 18.9	— IO 32	1.3 +0.04
23		70	4499	2271	13 22.6	+ 14 27	5.2 : 5.0
24	12	74	4516	2283	13 25.8	- 5 38	4.9 : 5.0
25		78	4529	2292	13 28.1	+ 4 16	4.9 : 2.1
26	5	79	4532	2294	13 28.6	+ 0 1	3.5 : 3.4
27		89	4608	2341	13 43.3	- 17 32	5.5
28	7	93	4672	2373	13 55.6	+ 2 7	4.4 : 4.3
29			4700	2384	14 4'3	- 15 44	5.5
30			4713	2388	14 6.2	-+ 2 58	5.0 : 5.4
31	к	98	4716	2390	14 6.2	- 9 43	4.3 : 4.1
32	ı	99	4727	2398	14 9.7	- 5 26	4.5 : 3.0
33	λ	100	4743	2408	14 12.6	- I2 49	4.6 : 4.7
34	υ¹	102	4748	2410	14 13.4	— I 42	5.2 : 5.0
35	φ	105	4792	2428	14 22.0	- I 4I	4.9 : 4.9
36	μ	107	4855	2457	14 36.7	- 5 8	3.9 : 3.9
37		109	4878	2468	14 40.5	+ 2 24	3.7 : 4.0
38		110	495 ¹	2512	14 56.8	+ 2 34	4.6 : 5.0

 ω (5.5); d^2 (5.4); Fl. 57 (5.4); Fl. 63 (5.5); i (5.5); h (5.5); m (5.3); r (5.3); B.A.C. 4722 (5.5).

84. PISCIS VOLANS (VOLANS).

Fr. Le Poisson Volant; Germ. Der Fliegende Fisch.

				R.A.	Decl.
				h. m.	0
Meridional Cen	tre of Constell	lation	 	8 40	-69
	/ Preceding		 	6 40	
Approximate	Following		 	90	
Boundaries,	North		 		-63
1900.	South		 		-75

The proper name of this constellation is the first of those given above, but as there are already two other constellations of Fish it has been found convenient to indicate this asterism by the single name "Volans." Its chief stars are:—

			Mag.
Y		 •••	 3.8
β	S	 	 3.0

There are 5 stars of mags. $4-5\frac{1}{2}$.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference.	R.A. 1880.	Decl. 1880.	Magnitude, Harv. or Arg. : Oxford.
				20.30	h. m.	0 ,	
1	γ		2400	A 8	7 9.8	— 70 18	3.8
2	δ		2447	A 10	7 16.9	-67 44	4.1
3	5		2607	A 16	7 43'3	- 72 20	4.3
4	€		2773	A 22	8 7.6	-68 16	4.2
5			2835	A 25	8 20.1	-71 7	5.5
6	β		2863	A 29	8 24.4	- 65 44	3.9
7	а		3114	A 46	9 0.6	- 65 55	4.5

ι (5.6); Lac. 2646 (5.7); Lac. 3313 (5.7); Lac. 3357 (5.7); η (5.7); θ (5.6); Lac. 3609 (5.9).

85. VULPECULA ET ANSER.

Fr. Le petit Renard avec L'oie; Germ. Das Füchschen mit der Gans.

			R.A.	Decl.
			h. m.	0
Meridional Cent	tre of Constellation		 20 10	+ 25
	Preceding		 19 0	
Approximate	Following		 21 20	
Boundaries,	North			+ 29
1900.	South	•••		+ 20

As a fox and a goose were formerly considered 2 things which naturally went together, so Vulpecula had an Anser joined to it, but the Anser has fallen into disuse. The brightest star is a, of mag. 4.4, and there are in this constellation no fewer than 14 other stars ranging between mags. 4.7—5.2.

No.	Letter.	Flam- steed.	B.A.C.	Harvard or Argent, Reference,	R.A. 1880.	Decl. 1880.	Magnitude. Harv. or Arg.: Oxford.
					h. m.		
1		. I	6589	3300	19 11.1	+ 21 11	4.7 : 4.8
3		3	6637	3329	19 17.9	+ 26 2	5.0 : 2.0
3		4	6654	3347	19 20.2	+ 19 34	5.5 : 2.0
4	a	6	6674	3357-8	19 23.7	+ 24 25	4.4 : 4.6
5		9	6709	3372	• 19 29:3	+ 19 31	5.0 : 2.1
6		12	6810	3433	19 45'9	+ 22 18	5.0 : 2.2
7		13	6827	3443	19 48.4	+ 23 46	4.7 : 5.0
8		15	6879	3481	19 56.2	+ 27 26	4.9 : 5.0
9			6966	3530	20 10'2 .	+ 25 14	4.8 : 5.1
10		23	6973	3534	20 10.8	+ 27 27	4.8 : 4.7
11		29	7140	3616	20 33.2	+ 20 47	4.8 : 4.7
12		28	7143	3619	20 33.3	+ 23 42	5.1 : 2.3
13		30	7188	3640	20 39.7	+ 24 51	5.1 : 2.0
14		31	7246	3668	20 47.0	+ 26 38	4.7 : 4.6
15		32	7256	3676	20 49.5	+ 27 36	2.1 : 2.3

Fl. 5 (5.4); Fl. 10 (5.4); Fl. 16 (5.4); Fl. 17 (5.3); Fl. 18 (5.5); Fl. 21 (5.3); Fl. 22 (5.5); Fl. 24 (5.5); Fl. 25 (5.4); Fl. 35 (5.4).

CHAPTER IX.

ON FINDING THE STARS a.

ARMED with the time and a telescope, the amateur astronomer may take the field, and make observations of interest and utility, if he proceed on a deliberate festina lente principle. He has only to recollect that one good observation

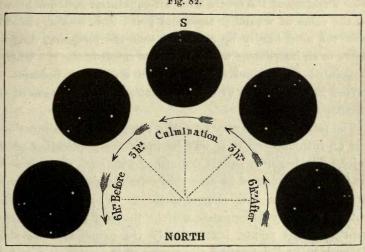


Fig. 82.

APPARENT CHANGES IN A GROUP OF STARS IN THE COURSE OF 12 HOURS BETWEEN RISING AND SETTING.

is worth more than fifty bad ones, and "hasten slowly" to obtain it.

It will be necessary for a beginner to accustom himself to the

^a Revised and expanded from Smyth's Cycle of Celestial Objects, vol. i. p. 404, et seq.

varying positions which the constellations occupy between their risings and settings, and this can only be correctly followed by a telescope turning on a polar axis. In fixed instruments, such as circles or transits, which are restricted to the meridian, the course of a celestial object across the field of vision, under an astronomical eye-piece, will be from the right horizontally to the left. But in extra-meridian or universal instruments, it will vary as regards its line of position with the horizon at each degree of its advance towards culmination, and from thence to its setting. In the preceding diagram, the arrows show the direction in which the bodies pass the telescope, and the dark circles represent the field of vision for every 3 hours after the group rises, till it goes down.

Here it is evident that, however the position of the group of stars alters to the eye and the senses, its line of position, as seen from a station at the centre with an equatorial instrument, will be the same at whatever time and point it is looked at. The observer need hardly be reminded that the foregoing diagram refers to an instrument which is turned towards the S.: when it is pointed to the polar regions, each movement becomes reversed in the field, as to the culminations and passages of the circumpolar stars.

The principal stars may be easily recognised by allineations; but an introductory view will facilitate the application of the rules. The beginner should commence with such stars as never set in our climate, and he may then refer the situations of others to their positions with respect to these. A moonlight night, if not too strongly illuminated, will be the best for him to learn some standard points, because only the principal stars show themselves, and determine the figure of the asterism; and he will find that the winter affords the best nights, both from their length, and the absence of twilight. The observer will have made himself acquainted with the Great and Little Bears, some of the principal points in the Zodiac, Orion, the Pleiades, and the more remarkable groups, as a key to the others. His meridian line, however rude, will show him the southing, or

passing of every object over that meridian, and from thence he will readily advance upon the vicinity; an operation in which good celestial maps or globes will largely assist. But in resorting to such aid, it must not be forgotten that by virtue of the apparent rotation of the heavens, the stars, though preserving their mutual distances and relations, turn with that motion: the ideal lines which join them therefore receive variable directions, which may appear to differ from those on the maps, being sometimes horizontal, sometimes inclined, and sometimes vertical, after the manner represented by the small group passed round in the diagram on p. 237. This difficulty, however, need only be alluded to, since it is so readily overcome as to offer no real impediment to allineation; and though the tyro must not expect to become familiar with all the component stars of a constellation at once, he will soon unravel the apparent confusion, and know the lucida of each asterism, together with several of its principal components.

The Great Bear is the most conspicuous of those constellations which never set in our latitudes; the tail and hind quarters consist of 7 brilliant stars, 4 of which $(a, \beta, \gamma, \delta)$ are likened to a wain, the other 3 (ϵ, ζ, η) being fancifully called the horses; or the 7 taken together make "The Plough." The hind-wheels, or the two farthest (β, a) from the horses, are designated the Pointers, because they direct the eye upon the Pole-star (a) Ursæ Minoris), at the tip of the Little Bear's tail; and further on to the constellations Cepheus and Cassiopeia, which are situated in the Milky Way, where it is nearest to the pole b. Cassiopeia consists of several well-known stars, which are likened, according as viewed, to the letter M or W in form. The two northernmost wheels of the wain (δ, a) Ursæ Majoris) point to the very bright star Capella, in Auriga, which is also circumpolar in our latitudes.

Descending diagonally along the Milky Way from Cassiopeia

^b The following information respecting the distances of the stars of the Great Bear is given by way of providing an approximate scale of distances for general use.

The nearest "Pointer" (a) is $28\frac{3}{4}^{\circ}$ from the Pole; from a to β is 5° ; from β to γ is 8° ; from γ to δ is $4\frac{1}{2}^{\circ}$; from δ to ϵ is $5\frac{1}{2}^{\circ}$; from ϵ to ζ is $4\frac{1}{2}^{\circ}$; from ζ to η is γ° .

towards Capella, we come to Mirfak, in Perseus (a), and a little further from the pole we find Algol (β Persei), the variable star in Medusa's head: if we pass across the Milky Way in the opposite direction, we arrive at Deneb, the *lucida* of Cygnus (a); and beyond the Swan, a little out of the Milky Way, is Vega, the bright star in the Lyre (a). The Dragon consists of a very lengthy chain of stars sweeping partly around the Little Bear; and in the space bounded by Cassiopeia, Cygnus, and Draco, is the constellation Cepheus.

Near Algenib (γ Pegasi), and pointing directly towards it, are two conspicuous stars of Andromeda (α , β), and a third (γ) is a little beyond them. Andromeda will be readily known by the connection of the *lucida* in her head (α), with the large trapezium of Pegasus (α , β , γ).

An imaginary line projected through the Great Bear and Capella passes to the Pleiades (η Tauri, &c.), and then turning at a right angle towards the Milky Way reaches Aldebaran (α Tauri), the Bull's Eye, and the shoulders (α , γ) of Orion, who is known by his brilliant belt, consisting of three stars (δ , ϵ , ζ) placed in the middle of a quadrangle. Aldebaran is a star of a reddish tint, and the most prominent of the Hyades, a cluster resembling the letter V, not far from the Pleiades. Aldebaran, the Pleiades, and Algol (β Persei), make the upper, while Menkab (α Ceti), in the Whale's jaw, with Aries, form the lower points of a W. The head of Aries is denoted by two principal stars (α , β), one of them having a smaller attendant.

A fancied line drawn from Polaris (a Ursæ Minoris), and led midway between the Great Bear and Capella (a Aurigæ), passes to Castor (a Geminorum) and Pollux (β Geminorum), two well-known stars in the heads of the Twins; and to the south of Gemini it meets Procyon (a Canis Minoris), the lucida of the Lesser Dog. From thence, by bending the line across the Milky Way, and carrying it as far again, it reaches Sirius (a Canis Majoris), in the Greater Dog's mouth, and passes on to the conspicuous star which is the a of Columba Noachi.

Algol (\beta Persei) and the Twins point at Regulus (a Leonis),

the Lion's heart, which is situated at one end of an arc, with Denebola (\beta Leonis), the tuft of the Lion's tail, at the other end. South-preceding Regulus (a Leonis) is Cor Hydræ (a), and the space between them is occupied by the Sextant of Hevelius. The Pole-star and the middle horse of the wain (ζ) direct us to Spica, the lucida of Virgo (a), considerably distant, and at the horizon leads us into Centaurus. The Pole-star and the first horse (n Ursæ Majoris) conduct us nearly upon Arcturus, in Boötes (a), by which fine star, Spica (a Virginis), and Regulus (a Leonis), a splendid triangle is formed. Following at a distance to the southward is Antares (a Scorpii), the Scorpion's heart, constituting with Arcturus (a Poötis) and Spica (a Virginis) another large triangle, within which are the two bright stars of Libra (a and β).

The Northern Crown is nearly in a line between Wega (a Lyræ) and Arcturus (a Poötis); and the heads of Hercules and Ophiuchus are between Lyra and Scorpio. In the Milky Way, below the part nearest to Lyra, and on a line drawn from Arcturus (a Boötis) through the head of Hercules, is Altair, in the Eagle (a Aquilæ), making with Wega and Deneb (& Leonis) a conspicuous triangle. Closely following Aquila is a remarkable group of stars called Delphinus.

The last and brightest (a) of the three principal stars in Andromeda makes, with three of Pegasus (α, β, γ) , the large square or trapezium already mentioned; of which one of the sides (formed by \beta and a) points to Fomalhaut (a Piscis Australis), situated at a considerable distance in the mouth of the Southern Fish, between the tails of Cetus and Capricornus.

The line of the ecliptic may, with considerable accuracy, be traced by the eye, when it becomes familiar with the stars here enumerated. Not far from the Pleiades are the Hyades with Aldebaran (a Tauri), a little S. of the ecliptic. To the N.W. of Aldebaran, at some distance, is the chief star of Aries (a); while to the N.E. of that star are Castor and Pollux (a and B Geminorum). Regulus (a Leonis) is on the line of the ecliptic; and Spica (a Virginis) is but a little S. of it. The ecliptic thus R

VOL. III.

known, the zodiacal constellations are easily distinguished, in their order from W. to E. Thus Aries lies immediately between Andromeda on the N. and Cetus on the S., the three reaching nearly from the horizon to the zenith; Taurus will be recognised by the Pleiades, Aldebaran (a), and the Hyades; Gemini by Castor and Pollux (a and β); Cancer, the highest of the signs, by the Præsepe looming through its desert wastes; Leo, from the stars Regulus (a) and Denebola (B); Virgo, by Spica (a), to the S. of Coma Berenices; Libra in mid-distance between Corona Borealis and the Pole; Scorpio, by the reddish star Antares (a), and its three other very conspicuous stars (β, δ, π) ; Sagittarius, as being the lowest of all the signs; Capricornus, S. of the Dolphin; Aquarius, under the neck of Pegasus; and Pisces between Pegasus, Andromeda, and Cetus. As more will presently be said respecting these signs, it may suffice here to present the Latin hexameters, which were constructed to enable beginners to retain their names :--

> Sunt Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libraque, Scorpius, Arcitenens, Caper, Amphora, Pisces.

Or in the downright English memory-verses:-

The Ram, the Bull, the heavenly Twins,
And, next the Crab, the Lion shines.

The Virgin, and the Scales;
The Scorpion, Archer, and Sea-goat,
The Man that holds the water-pot,
And Fish with glitt'ring tails.

All the stars which are situated in the same horary circle will obviously pass the meridian at the same time, from the horizon through the zenith to the pole. In proportion to their proximity to the equator, the larger will be the circle described by the star, and the smaller as they near the pole; consequently, as the stars move over equal portions of circles in equal times, whatever be the diameters of the circles, the motion of those near the equator is apparently very rapid, and that of the polar ones as slow. Thus the changes of the whole are in simultaneous

concert; and the Table on pp. 244-5 exhibits the aspect of the heavens on the first day of every month, at midnight, throughout the year. The exact risings and settings of the constellations cannot, of course, always be observed, owing to terrestrial obstacles, which may block the horizon, but the noting them will mark the spot where they may be first looked for. The Risings are taken along the horizon, from the N. round by E. to the S.; the Culminations from the N. horizon, over the pole and zenith, and thence down to the S.; and the Settings are brought from the N. round by W. to the S. Polaris, though not always precisely on the meridian, is included in every month, as a standard mark and pointer.

With the Tables on pp. 244-5 may be used the following Table, which indicates that the tabular entries for midnight on the 1st day of the several months given in the 1st column stand good also for the different hours and different months exhibited in the next 6 columns.

Tabular entries for midnight on		Corresponding Months and Hours when the same Entries are available.													
the ist day of	6 p.m.	8 p.m.	10 р.ш.	2 a.m.	4 a.m.	6 a.m.									
January		March	February	December	November	October.									
February		April	March	January	December	November.									
March		May	April	February	January	December.									
April		June	May	March	February	January.									
May		July	June	April	March	February.									
June	September	August	July	May	April	March.									
	October	September	August	June	May	April.									
STREET, STREET	November	October	September	July	June										
September	December	November	October	August	July										
October	January	December	November	September	August										
November		January	December	October	September										
13 THE R. LEWIS CO.	March	February	January	November	October										

THE CONSTELLATIONS ON THE 1ST DAY OF EVERY MONTH, AT MIDNIGHT (FOR THE S. OF ENGLAND).

_			
Mo.	Rising.	Culminating.	Setting.
	Hercules, the legs,	Draco, the body.	Cygnus, the neck.
	Corona Borealis.	POLARIS.	Pegasus, the hoofs.
RY	Boötes, the knees.	Camelopardus, the head.	Pegasus, northern wing.
UA	Virgo, the shoulders,	Lynx, the head and neck.	Pisces, the ribbon.
JANUARY	Crater, the middle.	Gemini, the legs.	Cetus, the body,
5	Pyxis Nautica.	Monoceros, neck and chest.	Eridanus, middle reach.
	Argo Navis, the mast,	Canis Major, the head,	Columba.
	Lyra.	Cygnus. the tail.	Pisces, the northern fish.
	Hercules, the shoulders.	Cepheus, the knee,	Aries, the fore legs.
R	Serpens, the head.	Polaris.	Cetus, the head.
UA	Virgo, the feet.	Ursa Major, the head and fore legs.	Eridanus, north reach.
FEBRUARY.	Corvus, the feet.	Lynx, the tail.	Lepus, the fore legs,
EE	Hydra, the lower fold.	Cancer, the claws.	Canis Major, the hind legs.
N	Antlia Pneumatica.	Hydra, the head.	Argo Navis, the compass.
-	Cygnus, the following wing.	Lacerta, over the back.	Andromeda, the body.
12	Lyra.	Cepheus, preceding arm.	Triangulum.
Hi	Hercules, the head.	Polaris.	Taurus, the neck.
RC.	Ophiuchus, the head.	Ursa Maj., a and \beta, the hind legs.	Orion, the sword.
MARCH	Serpens, the middle,	Leo, the flank.	Canis Major, the head.
1	Libra, both dishes.	Crater, preceding edge.	Pyxis Nautica.
1	Hydra, the tail.	Hydra, the body.	1 yais Nautica.
	Lacerta.	Andromeda, the body.	A = 3 3 - 42 - 5 - 4
	Vulpecula et Anser.	Cassiopeia, the waist.	Andromeda, the feet. Perseus, Medusa's head.
	Sagitta.	Polaris.	
벌	Aquila, the tail.	Ursa Major, the tail.	Taurus, the horns. Orion, the head.
APRIL,	Ophiuchus, the knees.	Canes Venatici, the fore legs.	Monoceros, head and chest.
4	Scorpio, the head.	Virgo, the waist.	Pyxis Nautica,
	Centaurus, the head.	Corvus, the tail.	Antlia Pneumatica.
-	•		
	Andromeda, the feet.	Perseus, the head.	Auriga, the legs.
1	Pegasus, the fore legs.	Cassiopeia, the feet.	Gemini, the legs.
K.	Equuleus, the nosc.	Polaris.	Cancer, the southern tegs.
MAY.	Delphinus, the body.	Draco, the tail.	Hydra, the heart.
	Antinous.	Boötes, the body.	Crater, the base.
1	Scorpio, the tail.	Libra, preceding lanx.	Corvus, the body.
-	Lupus, the head.	Centaurus, the hand.	Centaurus, the head.
	Perseus, Medusa's head.	Auriga, the kids.	Gemini, the heads.
18	Triangulum.	Camelopardus, the chest.	Cancer, the body.
63	Pisces, the northern fish.	Polaris.	Leo, the fore legs.
JUNE	Pegasus, the wing,	Draco, the body,	Sextans,
15	Aquarius, the shoulders.	Hercules, the back.	Corvus, the wings.
1	Capricornus, the head.	Ophiuchus, preceding thigh.	Hydra, the tail.
	Sagittarius, the body.	Scorpio, the tail.	Lupus, the head.
_			

Mo.	Rising.	Culminating.	Setting.
JULY.	Auriga, the waist. Perseus, the feet. Aries, the head. Pisces, the tails. Aquarius, the legs. Sagittarius, the hips.	Lynx, the head. Camelopardus, head and neck. POLARIS. Draco, two folds. Lyra. Scutum Sobieskii. Sagittarius, the head.	Lynx, the hind legs. Leo minor, the legs. Leo, the rump. Virgo, the shoulders. Libra, the preceding lanx. Scorpio, the body.
AUGUST.	Lynx, the body. Gemini, Castor's arm. Auriga, the knecs. Taurus, the head. Cetus, mouth and body. Piscis Australis, the head. Microscopium.	Ursa Major, the head. POLARIS. Cepheus, the sceptre. Cygnus, a, the body. Vulpecula, the flank. Delphinus, the body. Capricornus, the neck.	Leo minor, the head. Coma Berenices. Boötes, the feet. Libra, the following lanx. Ophiuchus, the legs. Sagittarius, the waist.
SEPTEMBER.	Leo Minor, the head. Lynx, the hind legs. Gemini, the bodies, Orion, the shoulders. Eridanus, upper reach. Cetus, the legs. Sculptor.	Ursa Major, the body. Draco, tip of the tail. POLARIS. Cepheus. head and body. Pegasus, the chest. Aquarius, the stream. Piscis Australis, the head.	Canes Venatici, Charu's chest. Boötes, the knees. Serpens, the head. Ophiuchus, the waist. Scutum Sobieskii. Sagittarius, the robe. Piscis Australis, the tail.
OCTOBER.	Leo Minor, the fore body. Cancer, the body. Canis Minor, the head. Monoceros, the neck. Orion, the following leg. Lepus, the head. Fornax Chemica.	Ursa Major, the tail. Draco, the tail. POLARIS. Cassiopeia, the head. Andromeda, the breast. Pisces, the ribbon. Cetus, the tail.	Boötes, the shoulders, Corona Borealis. Hercules, the shoulders. Ophiuchus, the head. Capricornus, the head. Piscis Australis, the head,
NOVEMBER.	Canes Venatici, Chara's chest. Leo, the fore body. Hydra, the head. Monoceros, the flank. Canis Major, the head. Lepus, the body. Eridanus, middle stream.	Draco, the last quoil. Ursa Minor, the head. POLARIS. Perseus, the head and shoulder. Aries, the body. Cetus, the mouth. Fornax Chemica.	Hercules, the legs. Vulpecula. Sagitta. Aquila, head and body. Equuleus. Aquarius, the legs. Sculptor.
DECEMBER.	Boötes, the head. Coma Berenices. Leo, the hind legs. Sextans. Hydra, the heart. Argo Navis, the mast. Canis Major, the hind legs.	Draco, the middle. Ursa Minor, the haunch. POLARIS. Camelopardus, the body. Taurus, the head. Eridanus, the northern reach. Eridanus, the southern reach.	I yra, Cygnus, the head. Vulpecula, the hind legs. Pegasus, the head. Pisces, the preceding fish. Cetus, the tail. Fornax Chemica,

Those who are possessed of an Astronomical Catalogue may readily find the mean apparent time of any individual star passing the meridian on any given day of the year, by adding the number placed against the date, in the following Table (p. 247), to the Right Ascension of the star taken from the catalogue. This depends, as the reader will perceive, on the star's distance to the East of the Sun at the required time; and as the Table shows the Sun's Eastern distance from the first point of Aries, the culmination of every object is of course easily found by the proposed addition. If the Sun be more than 24 hours, the latter number must be subtracted from it. From the sum thus obtained—to be roundly exact—subtract 1^m, 2^m, or 3^m, according as it exceeds 6, 12, or 18 hours, or approaches closely upon them: by this ready means the time of culmination is found, counting from the noon of the given day. This Table will be sufficiently exact for mere star-gazing purposes till the end of the 19th century.

As it may assist a first attempt to give an example or two, we will show the culmination of Sirius on the 11th of January 1890, of Arcturus on the 11th of March, and of Vega on the 30th of May, for the same year:—

	I.				
			h.	m.	8.
Sirius			6	40	17
Tabular No			4	29	
			11	9	17
	II.				
			h.	m.	s.
Arcturus			14	10	38
Tabular No			0	35	
			14	45	38
	III.				
	111.		h.	m,	s.
Vega			18	33	12
Tabular No			19	32	
			-	5	
		$-24^{h} =$	14	5	12

Da	ays.	Ja	n.	Feb.	Ma	arch.	A	pril.	М	ay.	Ju	ine.	Ju	ıly.	A	ug.	Se	pt.	0	ct.	N	ĭov.	I	ec.
6	1	h. :	m.	h. m	h.	m,	h.	m.	h.	m,	h.	m.	h	m.	h	m.	h		-		-		-	-
100	1	5	14	3 1	1	12	23	-		27		24	17		15	15	13	m.		m.		m.		m.
8	2	5	9	2 57	1	8	23			23	100	20	1	16	15	II	13	15	II	31 27	1	35	7	31
	3	5	4	2 53	1	4	23	11	1	19	19	16	17		15	7	13	12	II	24	1 -	31 27	7	27
	4	5	0	2 49	1	1	23	7	21	16	19	12	17	8	15	4	13	8	II	20	1-	23	7 7	18
	5	4 !	56	2 45	C	57	23	4	21	12	19	8	17	4	15	0	13	5	-	17	-	19		14
	,																	No.			1	- 9	-	-7
	6	4 :		2 41		53	23		21	8	19	4		59	14	56	13	I	11	13	9	15	7	9
1	7	4 4		2 37		17	22		21	4	19	0	16	55	14	52	12	57	II	9	9	II	7	5
9	8	4 4		2 33			22	53	21	0	18	56	16	51	14	48	12	54	II	6	9	7	7	1
	9	4 3		2 29		42	1	49		56	18	51	16	47		44	12	50	ΙΊ	2	9	3	6	56
1	0	4 3	34	2 25	10	38	22	45	20	52	18	47	10	43	14	41	12	47	IO	58	8	59	6	52
T	I	4 2	20	2 21	0	35	22	42	20	48	18	43	16	39	T.4	37	12	12			0		6	
1000	2	4 2	-	2 17	0	1000	22			44	18		16	35	1	33	12	43	10		8	55	6	47
	3	4 2	-	2 13	0	27	22		1	4I	18	35	16	31	1	29	12	36	10	51 47	8	51 47	6	43
	4	4 1	-	2 9			22			37	18	31		27	100	26	12	32		43		47	6	39
	5	4 1	12	2 5	1	20	22	27		33	1	27	1 -	23		22		29		40		39	6	34
Tis.										00		X.								7		07	Ĭ	30
1	6	4	8	2 I	0	16	22	23	20	29	18	22	16	19	14	18	12	25	IO	36	8	35	6	25
	7	4	4	I 57	0	13	22	20	20	25	18	18	16	15	14	14	12	21	10	32		30	6	21
1	8	3 5	59	I 54	0	9	22	16	20	2 I	1	14	16	II	14	II	12	18	10	28	8	26	6	16
	9		55	I 50	0			12		17	18	IO	16	7	14	7	12	14	10	25	8		6	12
2	0	3 5	51	1 46	0	2	22	8	20	13	18	6	16	3	14	3	I 2	II	IO	21	8	18	6	8
	,	2		T 42	22	-8	22	-			+0		7.5	*0			7.0	9			0		,	
	1 2	3 4		I 42 I 38	23	58 55	22	5	20	9	18	2		59		59	12	7	10		8	14	6	3
	3	3 3	- 1	I 34	23	-	21	57	20	5	17	53	15	55 51	-	56 52	12	3	10	13	8	9	5	59
1000	4	3 3		I 31	23	100	21	53	20	I	17	49	15	47	13		11	56	10	6	8	5	5	54
	5	3 3		I 27	-	44	21		19	57	17		15			45	11	53	IO	2		57	-	45
1		0 0							19	53	,	To		147	-3	TU		00			•	01	0	70
2	6	3 2	6	I 23	23	40	21	46	19	49	17	41	15	39	13	41	11	49	9	58		53	5	41
2	7	3 2	I	1 19	23	36	21	42	19		17	37	15	35	13	37	11	45	9	54	7	48	5	36
2	8	3 I	7	1 16	23	33	21	38	19		17	32	15	31	13	34	11	42	9	50		44	5	32
2	9	3 1	3	1 14	23	29	21	35	19		17	28	15	27	13	30	11	38	9	47	7	40	5	28
3	0	3	9	•••	23	25	2 I	31	19	32	17	24	15	23	13	26	11	35	9	43	7	35	5	23
3	I	3	5		23	22			19	28			15	19	13	23			9	39			5	19
		SILA		5000			_	00					Val					E			1		216	

To the mere star-gazer the following Table (see pp. 248-9) of the approximate apparent times of the meridian passages of the principal fixed stars, with the point in the horizon of their rising and setting, and the duration of their visibility, on the 1st day of each month, may be acceptable. The stars are selected to form a net over the whole of the N. hemisphere. This Table is computed for 1892.

		-	-			200	1
	OF THE REAL PROPERTY.		ME.				
STARS.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
AND THE RESERVE OF THE PARTY OF			793				. 1815
		ERVE	the S	L MELLS		2 7 1 1	
Cons'e'lation. Names. Mag.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
a Andromedæ Alpheratz I	5 23	3 22	1 28	23 22	21 24	19 22	17 24
γ Pegasi Algenib $2\frac{1}{2}$	5 29	3 27	1 33	23 27	21 29	19 27	17 29
a Cassiopeiæ Schedir 3	5 55	3 53	I 59	23 53	21 55	19 53	17 55
β Ceti Diphda $2\frac{1}{2}$	5 59	3 57	2 3	23 57	21 59	19 57	17 59
a Ursæ Minoris Polaris 2½	6 40	4 38	2 44	0 38	22 40	20 38	18 40
a Arietis Hamal 3			6			27 20	**
	7 22 8 15	5 20 6 13	3 26	I 20	23 22	21 20	19 22
T . 371 6 7 1	8 38	6 36	4 19	2 13	0 15	22 13	20 15
a Persei Mirfak $2\frac{1}{2}$ a Tauri Aldebaran 1	9 51	7 49	4 42	2 36	0 38	23 49	21 51
a Aurigæ Capella I	10 30	8 28	5 55 6 34	3 49 4 28	1 51	0 28	22 30
and the second s	-0 30		0 54	4 20	2 30	20	32 30
β Orionis Rigel I	10 30	8 28	6 34	4 28	2 30	0 28	22 30
β Tauri Nath 2	10 40	8 38	6 44	4 38	2 40	0 38	22 40
a Orionis Betelgeuze 1	11 4	9 2	7 8	5 2	3 4	1 2	23 4
a Canis Majoris Sirius I	12 1	9 59	8 5	5 59	4 I	1 59	O I
ε Canis Majoris Adara 2½	12 15	10 13	8 19	6 13	4 15	2 13	0 15
Conis Minoris Busques 1			0				
a Canis Minoris Procyon 1½	12 55	10 53	8 59	6 53	4 55	2 53	0 55
β Geminorum Pollux 2 a Hydræ Alphard 2	13 0	10 58	9 4	6 58	5 0	2 58	I O
	14 43	12 41	10 47	8 41	6 43	4 41	2 43
a Leonis Regulus I a Ursæ Majoris Dubhe 1½	15 24 16 18	13 22	11 28	9 22	7 24	5 22 6 16	3 24 4 18
a Clisæ Majoris Duone 12	10 10	14 16	12 22	10 16	8 18	6 16	4 10
β Leonis Denebola 2½	17 5	15 3	13 9	11 3	9 5	7 3	5 5
γ Ursæ Majoris Phecda 2	17 9	15 7	13 13	11 7	9 9	7 7	5 9
d Canum Venat Cor Caroli 21	18 12	16 10	14 16	12 10	10 12	8 10	6 12
a Virginis Spica I	18 41	16 39	14 45	12 39	10 41	8 39	6 41
η Ursæ Majoris Benetnasch 2½	19 4	17 2	15 8	13 2	11 4	9 2	7 4
		e it is		M. HELL	1 67 T D	3 14	3000
a Boötis Arcturus I	19 32	17 30	15 36	13 30	11 32	9 30	7 32
a Coronæ Borealis Alphecca 2	20 51	18 49	16 55	14 49	12 51	10 49	8 51
a Serpentis Unukalhay 2½	21 0	18 58	17 4	14 58	13 0	10 58	9 0
β^1 Scorpii Acrab 2	21 20	19 18	17 24	15 18	13 20	11 18	9 20
a Scorpii Antares 1	21 44	19 42	17 48	15 42	13 44	11 42	9 44
β Draconis Alwaid 2	22 49	20 47	18 53	16 47	14 49	12 47	10 49
a Ophiuchi Rasalague 2	22 51	20 47	18 55	16 49	14 49	12 47	10 51
γ Draconis Etamin 2	23 15	21 13	19 19	17 13	15 15	13 13	11 15
a Lyræ Vega 1	23 54	21 52	19 58	17 52	15 54	13 52	11 54
a Aquilæ Altuir 11/2	I 7	23 5	21 11	19 5	17 7	15 5	13 7
		0 0		9 0	lyn Sal		
a Cygni Deneb I	1 59	23 57	22 3	19 57	17 59	15 57	13 59
a Cephei Alderamin 3	2 37	0 35	22 41	20 35	18 37	16 35	14 37
ϵ Pegasi $Enif$ $2\frac{1}{2}$	3 0	0 58	23 4	20 58	19 0	16 58	15 0
a Piscis Australis Fomalhaut 1	4 13	2 11	0 17	2.2 11	20 13	18 11	16 13
a Pegasi Markab 2	4 20	2 18	0 24	22 18	20 20	18 18	16 20
	10000						1

-	在100mm 200mm 200m	P. C.				PINT		O.C.		SI-IE		Point of				
	STARS.	Aug	g.	Sep	t.	Oct		Nov		Dec.			01111 01	5 · 50 · 50 · 60		
	as getting											Rising.	Hours to mer.	Setting.		
	Constellation.	h. 1	m.	h. 1	m.	h. 1	n.	h. I	n.	h. n	1.		19			
0	Andromedæ		22	13	1	II	1	9			3	N. E. $\frac{1}{2}$ N.	83	W. N. 1 N.		
	Pegasi		27	13		II	27	9	1		8	E. N. E.	71/4	W. N. W.		
	Cassiopeiæ	15	-	13		11	-	9	-	7 !	54		cumpol			
	3 Ceti	15		13		11	- 1	9	-		8			w. s. w. 3 s.		
	Ursæ Minoris	16		14	-	12	- 1	10	- 1	8			cumpol	AND DESCRIPTION OF THE PERSON		
(Arietis	1.7	20	15	18	13	20	11	18	9 :	21	N. E. by E.	81	N. W. by W.		
1	ceti	18	13	16	11	14	13	I 2	11	10	14	E. 1 N.	61	$W.\frac{1}{2}N.$		
1	Persei	18	36	16	34	14	36	12	34	10	37	Cir	cumpol	ar.		
	Tauri	19	49	17	47	15	49	13	47	II	50	E N. E.	71	W. N. W.		
-	a Aurigæ	20	28	18	26	16	28	14	26	I 2	29	Cin	cumpol	ar.		
		3 11			19								303			
1	B Orion's	20	28	18	26	16		14	26	12	29	E. by S. $\frac{1}{2}$ S.	54	w. by s. $\frac{1}{2}$ s.		
	β Tauri	20	38	18	36	16	38	14	36	12	39	N. E. $\frac{1}{4}$ N.	83	N. W. 1 N.		
	a Orionis	21	2	19	0	17	2	15	0	13	3	E. by N.	61	w. by N.		
1	a Canis Majoris	21	59	19	57	17	59	15	57	14	0	E. S. E. $\frac{1}{2}$ S.	41/2	W. S. W. $\frac{1}{2}$ S.		
=	canis Majoris	22	13	20	II	18	13	16	II	14	14	S. E. 3/8.	3	S. W. 3 S.		
	A STATE OF THE STA						160	R. J								
	a Canis Minoris	22	53	20	51	18	-	16	51	14	54	E. $\frac{3}{4}$ N.	61/2	W. 3 N.		
	β Geminorum	22	58	20	56	18	58	16	56	14	59	N. E. $\frac{1}{2}$ N.	9	N. W. $\frac{1}{2}$ N.		
	a Hydræ	0	41	22	39	20	41	18	39	16	42	E. by S. $\frac{1}{4}$ S.	$5\frac{1}{2}$	w. by s. 4 s.		
	a Leonis	I	22	23	20	21	22	19	20	17	23.	E. N. E.	74	W. N. W.		
	a Ursæ Majoris	2	16	0	14	22	16	20	14	18	17	Cia	reumpo	lar.		
	β Leonis	3	3	I	1	23	3	21	1	19				W. N. W. 1 N.		
	γ Ursæ Majoris	3	7	1	5	23	7	21	5	19			cumpo			
	12 Canum Venat.	4	10	2	8	0	IO	22	8	20	11		rcumpo			
	a Virginis	4	39	2	37	0	39	22	37	20	40			w. by s. $\frac{1}{2}$ s.		
	η Ursæ Majoris	5	2	3	0	I	2	23	0	21	3	Ci	cumpo	lar.		
		1				33			-0			1	1 -3	N. w. by w.		
	a Boötis	-			28	1	30		28	2 I	-	N. E by E.	73	N. W. 1 N.		
	a Coronæ Borealis	1	49		47		49		47	22		N. E. $\frac{1}{2}$ N.	81	-		
	a Serpentis		58		56	1	58		56	22		E. by N.	61/2	w. by N. s. w. by W.		
	β^1 Scorpii	7	18	5	16		18		16	23		s. E. by E.	44	S. W.		
	a Scorpii	7	42	5	40	3	42	I	40	23	43	S. E.	3 1/2	1 S. W.		
	2	0		1			47	-	4.5	-	.8	C	reumpo	lar.		
	β Draconis	1	47		45	1000	47		45	1	48			W N. W.		
	a Ophiuchi	1	49		47	1			47		50		rcumpo			
	γ Draconis	1	13		II		13		11	100	14		rcumpo			
	a Lyræ	100	52	1	50		52		50		53			w. by N. 1/4 N.		
	a Aquilæ	II.	5	9	3	7	5	5	3	3	6	E. Dy N. 4 N.	1			
	C		pr be	1		1	57	-	55	2	58	Ci	Circumpolar.			
1	a Cygni		57	-	55		35	1 -	33	1	36		Circumpolar.			
	a Cephei		35		33		58		56		59			w. by N. 1 N.		
	ε Pegasi		58	17.7	56	1	11	8			12	s. E. by s.	1	s. w. by s.		
	a Piscis Australis	1	II	12	1	1	18	1	9	1	19	E. N. E.	71	W. N. W.		
	a Pegasi	. 14	18	12	16	10	10	0	10	0	19					

The foregoing Table, as already stated, shows the culminating times of the stars on the first day of each month; and this will be sufficient for the mere general reconnoitre of the heavens, which an amateur may take previous to making a settled gaze with his instrument. To find the time of passage for any intervening day, subtract the portion of time corresponding to the stated day of the month, in the following Table of Corrections.

Ī	Days.	Ja	ın.	F	eb.	Ma	rch.	Ap	ril.	M	ay.	Ju	ne.	Ju	ly.	A	ug.	Se	pt.	0	ct.	No	v.	De	эс.
		h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m
ı	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	2	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4
ı	3	0	9	0	8	0	7	0	7	0	8	0	8	0	8	0	8	0	7	0	7	0	8	0	9
ı	4	0	13	0	I 2	0	11	0	II	0	11	0	I 2	0	12	0	12	0	II	0	II	0	I 2	0	13
ı	5	0	18	0	16	0	15	0	15	0	15	0	16	0	16	0	15	0	14	0	15	0	16	0	17
ı	6	_	22	0	20		10	0	18	_	19	_	2.1				19	•	18	_	18	^	20		20
ı	MCO INC	0	-	0			19		22		- 1		21		21	- 31	-			0	2.00	0			22
1	7 8		30	0	24	0	26	-	26		23		25	0	25	0	23		22		22	0	24 28	0	26
ı	9		35	0	32	0	30	0	29		30		-	0	29	0	31	0	25		29		32	0	30
1	10		39	0	36	12	33	100	33	0	35	-	33	0	33	0	35		32		33		36	0	35
ı	-		29		30		99		99		99		31	0	37		99		3"	Ĭ	99	Ĭ	50		99
I	11	0	43	0	40	0	37	0	36	0	39	0	41	0	41	0	38	0	36	0	37	0	40	0	44
1	12	0			44	0	41	0	40		42		45	0	45	0	-	0	40		40		44	0	48
1	13	0	52		48	0	44		44		46		49	0	49	0	46	0	43		44	0	48	0	52
I	14	0	56		52	0	48		48	1	50		54	0	53	0	50	0	47	0	48	0	52	0	57
1	15	I	I	0	56	0	52		51	0	54	0	58	0	57	0	53	0	50	0	51	0	56	I	1
1	SHIP!	13		1				1	244	1	101	1	SEL						100	1		1		1	-
1	16	I	5	I	0	0	55	0	55	1	58	I	2	I	I	0	57	0		0	55	I	0	I	6
1	17	I	9	I	3	0	59	0	59	I	2	I	6	I	5	I	I	0	58	0	59	I	4	I	10
١	18	1	13	I	7	I	2	I	2	I	6	I		I	9	I	5	I	I	I	3	I	9	I	15
1	19		18	1	11	I	6	I	6	1	10	I	14	I	13	I	8	I	5	I	6		13	I	19
ı	20	I	22	I	15	I	10	I	10	I	14	I	19	I	17	I	12	I	8	I	10	I	17	I	24
	21	T	26	I	19	1	14	1	13	T	18	I	23	J	21	J	16	I	12	I	14	I	21	T	28
1	22	I		1	23	1	17		17	I			27		25	I			16	I	-	1	25	1	32
-	23	I	0	I	-		21	I		I	-	I		I	29	I	,	I		I		I	30	I	37
	24	I	39	I	30	I	24	1	25	1		I	35	1	,	I	27	I		I		I	34	1	41
	25	1	43	I	34	I	28	I	28	I	34	I	39	I	37	I	1	I	26	I	29	I	38	I	46
1			Serie!		100			1		13		-				13					TAYS.	1		1	13
	26	I	47	1	38		32	I	32	I	38		44	I	41	I		1	30	I	33	I	42	I	50
-	27	I			42	I	35	I	36	I		I	48	I	45	I	38	I	34	I	37	I	47	I	55
	28	1	56		45	I	0)	I	40	I			52		49	1	- 10	I		I		1	51	I	59
	29	2	0	I	48		43		. 44	I	50	1	56	I	53	I	45	I	900		44	1	55	2	3
	30	2		1	•••	I			47	I	00	2	0	I	0.	I	17	I	44	I		I	59	2	8
3	31	2	8	1		I	50			I	59	1	•••	2	1	I	52	1		I	52		•••	2	12
	oles	1	16		Mary.	1	-	1	1		100		100		964		100	1	-	1	-	-		1	

The following Table will be found to exhibit in a very condensed form the positions of a few of the leading constellations visible in England at different times of the year:—

January	Draco	Lyra	Servens	Sacittarius
	Cepheus			
March	Cassiopeia	Pegasus	Aquarius.	A SHELL BY
April	Cassiopeia	Andromeda	Pisces	Cetus.
May	Perseus	Aries	Cetus	Eridanus.
June	Perseus	Taurus	Orion.	
July	Lynx	Gemini	Canis Major.	
August	Ursa Major	Cancer	Hydra.	archesis and
September	Ursa Major	Hydra	Leo.	
October	Ursa Major	ComaBerenices	Virgo.	Els Santania
November	Boötes	Corona	Libra.	
December	Draco	Hercules	Ophiuchus	Scorpio.
		Service of the service of		HUNES AND SECOND

To use this Table; count as many months forward on the Table as half the number of hours that have elapsed since noon. This will give the constellations exactly on the 1st day of each month, and it will not be difficult to make the requisite allowance for the intermediate days. Thus, for 8 P.M. on the 1st January, count 4 (being half of 8) months forward, and opposite May we shall find Perseus, Aries, Cetus, and Eridanus, which constellations will be due S. at the time in question on Jan. 1. The constellations named below these will be visible to the West of the meridian, and those above them to the East thereof.

Amateurs will find a Planisphere very useful for identifying the constellations visible on any given night of the year. There are various forms of Planisphere in circulation. One of the most comprehensive is Grosse's b. This consists of a sheet of cardboard mounted on a frame 22ⁱⁿ by 19ⁱⁿ, having a circle 9ⁱⁿ in diameter cut out of the centre. Immediately behind this circular area, a circular map of the constellations visible in England is placed which can be made to rotate by means of a button, and so bring into view in succession the various con-

^b Sold by the author, 14 Weymouth Street, Manchester.

stellations which come to the meridian at the different seasons of the year. The outer edge of this rotating card is divided into 365 equal parts representing the days of the year. The blank spaces on the principal card are occupied with various useful memoranda connected with the constellations and the principal stars therein.

Smaller in size and more convenient in shape is Philip's "Planisphere'." This (which is made in two forms, for the Northern and Southern heavens respectively) shows the stars white on an indigo background. The printing is clear and good, and the moving parts and corners being made in black leather the whole affair is calculated to stand a considerable amount of knocking about and rough usage.

One of the newest and most original planispheres is the "Oxford Planisphere" devised by the Rev. Professor Pritchard. It is a rectangular chart forming a cylindrical projection of the heavens from the horizon of Greenwich to its zenith. All the brighter stars visible at Greenwich are given; i.e. from the 18 to the 4th magnitudes. A few other stars of individual interest are also projected, and a few nebulæ of importance; these have Messier's designations attached to them. The equator runs horizontally through the map; on it are marked the Right Ascensions from O hours to XXIV. The circles of Declination are drawn for every 10 degrees and are all parallel to the equator; the hour circles also are projected in parallel straight lines at right angles to the equator, and are drawn at intervals of I hour, being subdivided on the equator into 6 divisions, representing 10 minutes each. The ecliptic is projected as a dotted curve, with the positions of the Sun engraved on it for the first day of each month; and its position on intermediate days can be estimated proportionally. After this description the rotating circular chart will speak for itself. The stars above the line marked "Non-Setting Line, Greenwich," never set in that latitude. The Galaxy or Milky Way is the space bounded by faint dotted lines, and its northern pole is

^c Sold by Philip & Son, 32 Fleet Street, London.

marked G.P. in the Constellation Coma. The construction of this chart has this advantage, that it serves equally well for all the "Constellation Seasons." The stars forming each particular constellation are here linked together by faint lines. Any allineations of stars on the chart represent the equivalent allineations of the same stars in the skies. Hence if any strongly-marked constellations or configurations of stars, such as Orion, "the great square of Pegasus," Cygnus, Cassiopeia, Ursa Major, etc., are once mastered, the star-gazer can then make allineations for himself on the map, and transfer them successfully to the heavens. Thus he can hardly avoid "finding the stars."

CHAPTER X.

A CATALOGUE OF CELESTIAL OBJECTS.

THIS catalogue furnishes observers in any part of the world with a series of objects available for achromatic telescopes of about 3ⁱⁿ aperture and 4^{ft} focal length. With few exceptions, those objects which are visible in England have been examined by myself (many of them with an instrument of this size); the remainder have been selected by me chiefly from Sir J. Herschel's Cape Observations. Speaking generally, double stars are characteristic of the Northern heavens; remarkable clusters and nebulæ, of the Southern; nearly all the celebrated aggregations of stars being situated South of the celestial equator, whilst important doubles are rather scarce there. The marks are to this effect:—2 stars (**) indicate objects of very special size, brilliancy, or interest; one star (*) denotes objects of less importance but still deserving of special attention.

PART I.—DOUBLE, TRIPLE, AND MULTIPLE STARS.

As a general rule, no stars are inserted which are less than 2'' or more than 45'' apart. Also, as a general rule, no principal star is included which is less than the $6\frac{1}{2}$ magnitude, and no secondary one which is less than the $7\frac{1}{2}$; but in some special cases these limitations have been disregarded, as for instance in regions where objects are sparsely scattered and an adequate number fulfilling the requsite conditions could not be had. Many stars, double when examined with small telescopes, appear

triple or quadruple in larger ones: reckoned under the latter head they would be inappropriate in this list, but not so, regarded in the more elementary form. The magnitudes are chiefly from Smyth and Webb; the distances from many sources. The epochs are in all cases the most recent that were accessible, but many binaries vary considerably in their distance in the course of even a few years. It will be remembered that in double-star nomenclature, A denotes the largest star, and B, C, &c. the smaller ones in succession.

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No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
T	β Toucani	h. m. s. o 26 30	o , -63 34·0	both 5	28
*2	π Andromedæ	0 31 0	+ 33 6.8	41 and 9	35
**3	η Cassiopeiæ	0 42 26	+57 13.9	4 and 7 1/2	5·1 (1883). Binary.
*4	65 Piscium	0 43 58	+ 27 6.7	6 and 6	4.3
5	— Cassiopeiæ	0 47 44	+ 56 9.7	$7\frac{3}{4}, 8\frac{1}{2}, 11$	1.5" 4", multiple.
**6	ψ ^I Piscium	o 59 47	+ 20 53.0	both $5\frac{1}{2}$	29.4
*7	a Ursæ Minoris	1 18 14	+88 43.3	$2\frac{1}{2}$ and $9\frac{1}{2}$	18.4
8	6 Eridani	I 35 37	-56 45.2	both $6\frac{1}{2}$	6.3 (1880). Binary.
**9	γ Arietis	I 47 29	+ 18 45.3	4½ and 5	8.3"
*10	λ Arietis	1 51 47	+ 23 3.6	$5\frac{1}{2}$ and 8	37
**11	a Piscium	1 56 21	+ 2 14.0	5 and 6	3.0
**12	γ Andromedæ	1 57 8	+ 41 48.1	$3\frac{1}{2}$ and $5\frac{1}{2}$	10.5; B also double.
*13	59 Andromedæ	2 4 12	+38 31.2	6½ and 7	16
*14	ι Trianguli	2 5 59	+ 29 47.2	5 1 and 7	3.8
*15	ι Cassiopeiæ	2 20 0	+ 66 54.4	4½,7,and 9	2·1 and 7·5
	Black of the later			1271	
16	112 P. II. Fornacis	2 29 I	-28 42.7	$5\frac{1}{2}$ and 8	11
*17	30 Arietis	2 30 37	+ 24 10.2	6 and 7	38
*18	12 Persei	2 35 18	+ 39 43.7	6 and $7\frac{1}{2}$	23
**19	γ Ceti	2 37 36	+ 2 33.5	3 and 7	2.7
**20	η Persei	2 42 40	+ 55 26.3	5 and $8\frac{1}{2}$	28
*21	220 P. II. Persei		1 57 540	6 and 8	12
22		2 53 2	+ 51 54.9	5 and 6	8.5
23	7.11	2 54 5	- 40 44.0	3 1 and 8	2.6
I La Contraction	45.11	3 7 23		$5 \text{ and } 5\frac{1}{2}$	8.5
*25	P.11	3 44 33 3 48 46	-37 57.8 $-3 16.8$	5 and 52 5 and 7	6.7
25	32 Eridani	3 40 40	- 3 10.0	5 and 7	
*26	ε Persei	3 50 28	+ 39 41.5	$3\frac{1}{2}$ and 9	8.4
*27	χ Tauri	4 15 53	+ 25 22.2	6 and 8	19-2
*28	τ Tauri	4 35 38	+ 22 44.8	5 and 8	63
29	ι Pietoris	4 48 28	-53 39.0	$5\frac{1}{2}$ and $6\frac{1}{2}$	12.3
*30	14 Aurigæ	5 8 14	+ 31 33.6	5 and 7½	14.6
**.	00.		0		
**31	β Orionis	5 9 15	- 8 19.9	I and 9	9.5
*32	170 σ Leporis	5 14 27	-18 38.0	7 and $7\frac{1}{2}$	39
*33	23 Orionis	5 17 3	+ 3 26.3	5 and 7	31
*34	118 Tauri	5 22 30	+ 25 3.6	7 and 7½	5·I
*35	δ Orionis	5 26 23	- 0 22.9	2 and 7	53

		(1000)		CINE II	
No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	0 ,		"
**36	λ Orionis	5 29 5	+ 9 51.5	4 and 6	4.3
**37	ι Orionis	5 30 3	- 5 59.0	$3\frac{1}{2}$, 8, 11	11.2 and 49
**38	σ Orionis	5 33 3	- 2 38.0	4, 8, and 7	12 and 42; multiple star.
**39	Corionis	5 35 12	- 2 0.2	$3, 6\frac{1}{2}, 10$	2.6, 57
*40	41 Aurigæ	6 3 10	+ 48 44 0	6 and 7	7.8
44		6	6	61 10	6 (DO)
**41	II Monocerotis	6 23 29	- 6 57.7	$6\frac{1}{2}$, 7, and 8	7.2, 9.6 (BC = 2.5)
**42	V Puppis	6 35 41	-48 7.8	5½ and 7½	13
43	12 Lyncis	6 36 30	+59 33.1	$6, 6\frac{1}{2}, 7\frac{1}{2}$	1.6 and 8.7
*44	958 ∑ Lyncis	6 39 1	+ 55 .49.8	both 6	5.1
*45	38 Geminorum	6 48 26	+13 19.1	$5\frac{1}{2}$ and 8	6.3
*46	301 P. VI. Lyncis	6 56 55	+ 52 55.4	6 and 6½	3.2
47	2640 Lac. Carinæ	7 1 33	-59 0.6	6½ and 7½	2.4
48	γ Piscis Volantis	7 9 40	-70 19.2	5 and 7	13
*49	19 Lyncis	7 13 53	+55 28.6	7, 8, and 8	14 and 215
**50	a Geminorum	7 27 35	+32 7.8	3 and 31	5.6
50	a deminorum	1 -1 35	, 3- 1-	3 32	
*51	175 P. VII. Puppis	7 34 18	-26 33.1	both $6\frac{1}{2}$	9.8
*52	2 Puppis	7 40 26	-14 25.4	7 and 7½	17
*53	ζ Cancri	8 5 54	+18 0.9	$6, 7, \text{and } 7\frac{1}{2}$	1.0 and 5.7 (1886)
54	γ Argûs	8 6 8	-47 0.4	2 and 6	42
*55	φ² Cancri	8 20 8	+ 27 17.7	6 and $6\frac{1}{2}$	4.7
*56	108 P. VIII. Hydræ	8 30 1	+ 7 0.5	6 and 7	10.5
**57	124 P. VIII. Cancri	8 33 32	+19 56.0	$7, 7\frac{1}{2}, 6\frac{1}{2}$	45 and 93
58	b¹ Carinæ	8 54 17	-58 48.39	6 and 7	40
**59	38 Lyncis	9 12 0	+ 37 16.3	4 and 7½	2.9
**60	γ Leonis	10 13 54	+ 20 23.8	2 and 4	3.6
0384	77.1	10 05 11	-11 20.3	both 6½	14
61	s Velorum	Carlotte Control	-44 30·2	7,9,and 8½	71 and 6.7
*62	1474 ∑ Hydræ		-11 40.9	4½ and 7	6.4
*63	54 Leonis		+ 25 20.2	4 and 5 1	2.0 (1886)
*64	ξ Ursæ Majoris · · · ·	0	+ 32 9.5	4 and 52	2.6
*65	ι Leonis	11 18 11	+11 8.4	4 anu 72	2.0
66	17 Crateris	11 26 49	-28 39.6	5½ and 7	8.7
*67	go Leonis	0	+ 17 24.4	$6, 7\frac{1}{2}, 9\frac{1}{2}$	3.5 and 63
*68	65 Ursæ Majoris		+47 5.4	7,91, and 7	3.8 and 63
	2 Comæ Berenices		+ 22 4.5	6 and 7½	3.6
*69	15 P. XIL Centauri	12 8 13	-45 6.7	5½ and 7	4
70	15 1. All Celloadil	3	10 -1		

	The state of the s				
No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
	D WIL W.	h. m. s.	0./.	1.41.41	"
71	32 P. XII. Virginis	12 12 30	- 3 20.5	both $7\frac{1}{2}$	20
72	a Crucis	12 20 28	-62 29.3	$1\frac{1}{2}$, 2, and 5	5, 90 [quintuple]
**73	17 Comæ Berenices	12 23 25	+ 26 30.4	$4\frac{1}{2}$ and 6	145: for low power.
74	δ Corvi	12 24 11	-15 54.1	$3 \text{ and } 8\frac{1}{2}$	23
75	γ Crucis	12 25 2	-56 29.6	2 and 5	120
*76	24 Comæ Berenices	12 29 36	+18 58.9	$5\frac{1}{2}$ and 7	20
77	γ Virginis	12 36 5	- 0 50.8	both 4	5.3 (1885)
*78	232 P. XII. Camelop.	12 48 16	+84 0.7	6 and 61/2	22
**79	a Canum Venat	12 50 53	+ 38 54.7	$2\frac{1}{2}$ and $6\frac{1}{2}$	20
*80	54 Virginis	13 7 33	-18 14.5	7 and $7\frac{1}{2}$	5.3
AN INTE		NAME OF THE OWNER, OWNE			(14.4; Alcor, mag. 5,
**81	ζ Ursæ Majoris	13 19 29	+ 55 30-1	3 and 5	is distant 113/.
*82	f Hydræ	13 30 42	-25 56.0	6 and 7	10
*83	3 (k) Centauri	13 45 28	-32 26.5	6 and $7\frac{1}{2}$	8
**84	ι Boötis	14 12 17	+51 52.5	$4\frac{1}{2}$ and 8	38
85	5893 Lac. Centauri	14 14 44	-57 57.0	$6, 8\frac{1}{2}, 11$	9.6 and 35
*86	69 P. XIV. Boötis	14 17 58	+ 8 56.9	6 and 7½	6.2
87	a Centauri	14 32 7	-60 22.7	1 and 2	14.0 (1885)
**88	π Boötis	14 35 33	+ 16 53.5	$3\frac{1}{2}$ and 6	5.9
*89	54 Hydræ	14 39 39	-24 58.4	$5\frac{1}{2}$ and $7\frac{1}{2}$	9.0
**90	ε Boötis	14 40 11	+27 32.2	3 and 7	2.7; colours fine.
*91	39 Boötis	14 45 57	+49 10.3	6 and $6\frac{1}{2}$	3.6
*92	ξ Boötis	14 46 18	+19 33.6	$3\frac{1}{2}$ and $6\frac{1}{2}$	3.3 (1887)
*93	212 P. XIV. Libræ	14 50 55	-20 53.2	6 and 8	15
*94	44 Boötis	15 0 11	+48 5.0	5 and 6	4.7
95	к Lupi	15 4 16	-48 19.3	$5\frac{1}{2}$ and 7	27
96	μ Lupi	15 10 52	-47 28.9	5, 6, and 8	2·1 and 20
*97	μ Boötis	15 20 21	+ 37 45.8	4 and 8	108; B also double
**98	δ Serpentis	15 29 33	+ 10 54.5	3 and 5	(0·7": 1887). 3·4
*99	ζ Coronæ	15 35 14	+ 36 59.7	5 and 6	6.2
100	ξ Lupi	15 49 52	-33 38.9	6 and 61	11
**101	ξ Scorpii	15 58 19	-11 4.1	$4\frac{1}{2}$ and $7\frac{1}{2}$	$ \begin{cases} 7.1; \text{ A also double} \\ (1.1''). \end{cases} $
**102	β Scorpii	15 59 2	-19 30-2	2 and 51	13.6; A also double
*103	κ Herculis	16 3 6	+ 17 20.6	$5\frac{1}{2}$ and 7	(0.9").
*104	ν Scorpii	16 5 36	-10 10.3	4 and 7	1 40; both stars double;
105	36 P. XVI. Scorpii		-30 38.4	7 and 7 1	0.7", 2.0".
105	30 1. 11 11. Deorphi	10 14 35	30 30.4	7 4114 /2	

			Manager 1		
No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	0 /		"
*106	σ Scorpii	16 14 30	-25 16.8	4 and $9\frac{1}{2}$	20
**107	ρ Ophiuchi	16 18 59	-23 11.5	5 and 7½	3.4; two stars near make a trio.
**108	17 Draconis	16 33 37	+53 8.8	6,61, and 6	3.7 and 90
*109	μ Draconis	17 3 3	+ 54 37·I	4 and 41/2	2.6
*110	36 (A) Ophiuchi	17 8 34	-26 25.3	$4\frac{1}{2}$ and $6\frac{1}{2}$	4.6
**111	a Herculis	17 9 38	+ 14 30-9	$3\frac{1}{2}$ and $5\frac{1}{2}$	4.7
*112	39 Ophiuchi	17 11 18	-24 9.9	$5\frac{1}{2}$ and $7\frac{1}{2}$	10.8
**113	ρ Herculis	17 19 53	+ 37 14.9	4 and $5\frac{1}{2}$	3.9
**114	ν Draconis	17 30 0	+ 55 15.5	both 5	62
*115	ψ^1 Draconis	17 43 54	+72 12.5	$5\frac{1}{2}$ and 6	31
	6.011.11			1.0	
116	67 Ophiuchi	17 55 8	+ 2 56.2	4 and 8	55
*117	95 Herculis	17 56 50	+ 21 35.8	$5\frac{1}{2}$ and 6	6.1
*118	70 Ophiuchi	17 59 53	+ 2 32.5	4 and 6	2.0 (1886)
**119	100 Herculis	18 3 24	+ 26 4.8	both 7	14.1
**120	40 Draconis	18 8 16	+79 59.0	$5\frac{1}{2}$ and 6	20
121	κ Coronæ Australis	18 25 47	-38 47.8	$6\frac{1}{2}$ and $7\frac{1}{2}$	22
**122	ε Lyræ	18 40 41	+39 33-2	$5, 6\frac{1}{2}, 5, 5\frac{1}{2}$	3.4 and 2.5; distance A C 207.
**123	ζ Lyræ	18 40 59	+ 37 29.4	5 and 51/2	44
		18 46 1	+33 14.1	$\{3-5\}$ (var.), 8,	46, 60, and 71
**124	β Lyræ		T 33 14.1	$(8\frac{1}{2}, \text{ and } 9)$	
*125	θ Serpentis	18 50 45	+ 4 3.4	4½ and 5	21.7
*126	γ Coronæ Australis	18 59 0	-37 12.9	both 6	I <u>+</u>
127	15 Aquilæ	18 59 9	- 4 11.7	6 and 71	35
128	β¹ Sagittarii	19 14 44	-44 40·I	$4\frac{1}{2}$ and 8	29
**129	β Cygni	19 26 17	+ 27 43.7	3 and 7	34
*130	16 Cygni	19 38 54	+ 50 16-2	$6\frac{1}{2}$ and 7	37
*131	57 Aquilæ	19 48 40	- 8 30.8	$6\frac{1}{2}$ and 7	36
132	320 P.XIX. Vulpeculæ	19 48 31	+ 20 3.0	both 7	42
133	θ Sagittæ	20 5 5	+ 20 35.2	7, 9, and 8	11 and 75
*134	26 P. XX. Antinoï	20 6 38	+ 0 32.3	$6\frac{1}{2}$ and 7	3.5
*135	o² Cygni	20 10 10	+ 46 24.5	$4, 7\frac{1}{2}, 5\frac{1}{2}$	107 and 338
S. S. S.				a and 4	376 [use a very low
*136	a ² Capricorni	20 11 57	-12 53·I	3 and 4	power].
*137	κ Cephei	20 12 35	+77 22.7	$4\frac{1}{2}$ and $8\frac{1}{2}$	7.2
*138	β ² Capricorni	20 14 50	-15 7.8	3½ and 7	205
*139	o² Capricorni	20 23 36	-18 56-7	6 and 7	
*140	γ Delphini	20 41 33	+ 15 43.9	4 and $6\frac{1}{2}$	11.3

No.	Star.	R.A. 1890.	Decl. 1890.	Mags.	Distance and Notes.
		h. m. s.	0 ,		"
141	8550 Lac. Pavonis	20 42 26	-62 50.1	both 6½	3.2
*142	ε Equulei	20 53 35	+ 3 52.5	$5\frac{1}{2}$ and $7\frac{1}{2}$	$\begin{cases} 10.6; \text{ A also double} \\ (1.0''). \end{cases}$
*143	λ (2) Equulei	20 56 47	+ 6 44.8	6 and $6\frac{1}{2}$	2.8
*144	61 Cygni	21 1 57	+ 38 12.5	$5\frac{1}{2}$ and 6	20 (1884)
145	1 Pegasi	21 17 0	+19 20.0	4 and 9	37
**146	β Cephei		+70 4.6		13.3
**147	248 P. XXI. Cephei	21 35 33	+ 56 59.5	$6, 8\frac{1}{2}, 8\frac{1}{2}$	11.7 and 20
*148	μ Cygni	21 39 12	+ 28 15.0	5, 6, and 7½	3.9 and 208
*149	ξ Cephei	22 0 35	+64 5.4	5 and 7	6.6
*150	11 P. XXII. Cephei	22 4 52	+ 58 45.3	6 and $6\frac{1}{2}$	{ 21; B also double (0.6").
				TEO MARCH	
*151	33 Pegasi	22 18 21	+ 20 17.5	$6\frac{1}{2}$, 10, & 8	1.9 and 63
*152	53 Aquarii	22 20 34	-17 18.0	both $6\frac{1}{2}$	7.8
*153	ζ Aquarii	22 23 9	- 0 35.0	4 and 41/2	3.2 (1879)
*154	δ Cephei	22 25 5	+ 57 51.1	$4\frac{1}{2}$ and 7	40. A is var.
*155	8º Lacertæ	22 30 58	+ 39 3.9	$6\frac{1}{2}, 6\frac{1}{2}, 11, 10$	Two nearest, 23
*156	γ Piscis Australis	A SHOW THE REAL PROPERTY.	-33 27.5	5 and 9	3.5
157	9367 B.A.C. Gruis		-51 16.8	6½ and 7	8
*158	107 Aquarii	23 40 18	-19 17.5	6 and 71/2	5.8
. *159	σ Cassiopeiæ	23 53 25	+ 55 8.5	6 and 8	2.9
	A STATE OF THE STA	AL DEPTER	The Section of	A RESPONDENCE	

PART II,—CLUSTERS AND NEBULÆ.

Many clusters and nebulæ are visible with small telescopes, which cannot in any satisfactory way be examined by such instruments. The largest and brightest only have been selected for insertion in this list; and it may as well be stated at the outset, that many of them will be found disappointing with apertures below 5 inches. Abundant light and (generally) low magnifiers are essential requisites for the satisfactory examination of all kinds of clusters and nebulæ.

In the column of Synonyms—

D refers to Dreyer's new great Catalogue of 1888.

M " Messier's Catalogue.

H " Sir John Herschel's General Catalogue of 1864.

HI ,, Sir William Herschel's Catalogues.

h " Sir John Herschel's old Catalogue of 1833.

S " Smyth's Bedford Catalogue (1st ed.).

S & C , Smyth and Chambers's Cycle.

The notes are partly selected and partly original, but those who are accustomed to observe clusters and nebulæ will be well aware how different are the impressions conveyed by the same objects to different observers using telescopes of different capabilities.

CATALOGUE OF CLUSTERS

		No bearing		5	the state of		- 2000			
No.	Name or Constellation.		S	ynonym	in various Ca	atalogue	8.		R.A. 1890.	Decl. 1890.
		D	M	н	H	h	S	S&C	h. m. s.	0 /
**1	47 Toucani	104		52		2322		17	0 19 9	-72 41.6
**2	Andromeda	224	31	116		50	24	35	0 36 47	+ 40 40.1
3	Cetus	253		138	I v.	61	30	41	0 42 13	-25 53.7
4	Nubecula Minor	292		165		2356			0 48 41	-73 58.7
5	Toucan	362		193		2375			0 58 31	-71 26.2
	le calm	129/13					Will !	1		HAVE DE
6	Cassiopeia	581	103	341		126	55	78	1 25 56	+60 7.1
*7	Triangulum	598	33	352	17 v.	131	57	80	1 27 38	+ 30 6.8
**8	Perseus	869		512	33 vi.	207	92	133	2 11 20	+ 56 38.5
*9	Perseus	1039	34	584		248	106	152	2 34 57	+42 15.7
10	Eridanus	1365		731		2552			3 29 26	-36 30.4
**11	η Tauri						142	218	3 40 56	+ 23 45.9
**12	γ Tauri						159	241	4 13 31	+15 21.7
13	Columba	1851		1061		2777	•••		5 10 29	-40 10.2
14	Auriga	1912	38	1119			204	329	5 22 2	+ 35 44.1
15	Nubecula Major					•••			5 24 6	-69 34.1
		TOTAL STREET	G.	278.141						
*16	Taurus	1952	I	1157		357	212	341	5 27 51	+ 21 56.6
17	Auriga	1960	36	1166		358	214	343	5 29 2	+ 34 4.2
18 **19	Dorado	1978	•••	1181		2878			5 28 32	-66 19.0
**20	Orion	1976	42	1179		360	216	348	5 29 52	- 5 27.7
1.20	Orion	1981		1184		362	217	350	5 30 4	- 4 ² 5·4
**21	30 Doradûs	2070		1260		2047		26=	= 20 20	-69 9.4
*22		2070	27	1269	•••	369	230	367	5 39 29 5 45 2	+ 32 31.3
*23	Gemini	2168	37	1360	•••	377	236	388	6 2 4	+ 24 26.2
24	Orion	-6.	1 2 3	1361	24 viii.	379	238	391	6 3 15	+ 13 58.5
*25	Canis Major	2287	41	1454	24 111.	411	265	437	6 42 13	-20 37.8
			1.	107		7	-03	101	17.3	
26	Monoceros	2323	50	1483		425	276	451	6 57 41	- 8 10.7
*27	Puppis	2422		1551	38 viii.	459	296	488	7 31 33	-14 14.3
28	Puppis		46	1564		463	302	496	7 36 47	-14 27.3
29	Puppis			1593		3103		509	7 48 23	-38 15.7
30	Argo Navis	2516		1619		3111			7 56 31	-60 34.1
	The Land of the Land					1	1	1		

AND NEBULÆ.

No.	Description.
I 2	Superb globular cluster, 15' to 20' in diameter. Central stars pale rose colour; outer ones white. The great nebula; an elongated ellipse 2° long. ∫One of the finest, though faint, elliptic nebulæ, 30' long, 5' wide ±: some small stars
3 4	involved. Visible to the naked eye.
5	A highly condensed cluster, 4' in diameter.
6	A fine field.
7	Large roundish faint oval nebula, 40' in diameter ±; resolvable into stars.
8	The magnificent double cluster in the sword-handle of Perseus: stars 7 to 14 mag.
9	A fine group of rather large stars.
10	An oval and possibly spiral nebula.
11	The Pleiades.
12	The Hyades: a scattered group of rather large stars.
13	Bright globular cluster, 3' in diameter.
14	Cruciform cluster. In same field, 30' S., is 39 H vii. In a rich neighbourhood.
15	Visible to the naked eye.
16	The "Crab" nebula. Large elliptical nebula, resolvable into stars.
17	A neat cluster of 9 to 11 mag. stars, near M 38, with double star in field, dist. 12.
18	Mags. 8 and 9. Large and bright oval nebula.
19	The great nebula in Orion, with multiple star involved. The most magnificent of
20	the nebulæ. A brilliant field, 1° N. of θ .
21	Very large and irregular nebula.
22	G and laster of small store
23	Fine large cluster of 9 to 16 mag. stars. In same field to the N. 18 a neat cluster of
	small stars, 17 H vi. $\int \text{Loose cluster in the form of a trapezium, containing a pair of mags. 7\frac{1}{2} and 8\frac{1}{2}, 2-4"$
24	apart. 1° S. of v. Large scattered cluster, 4° below Sirius.
25	Large scattered duster, 4 below childs.
26	Cluster; rather more than \(\frac{1}{3} \) from Sirius to Procyon.
27	Bright neat cluster, with double star, 8" dist. A bright orange star precedes.
28	Large loose cluster of small stars, 8 to 13 mag., with faint planetary nebula involved.
29	Superb cluster, 20' in diameter.
30	Cluster of 200 or more stars, visible to the naked eye.

No.	Name or Constellation.		Sy	nonym	in various Ca	ıtalogue	s.		R.,	A. 189	0.	Decl. r	890.
		D	M	н	ı#I	h	S	S&C	h.	m.	s.	0	,
31	Puppis	2547		1636		3117		527	8	7 2	5	-48	56.3
32	Monoceros	2548		1637	22 vi.	496	318	531	8	8	8	- 5	28.0
**33	Cancer	2632	44	1681		517	331	547	8	33 8	55	+ 20	19.4
34	Cancer	2682	67	1712		531	339	558	8	45	0	+ 12	12.7
35	Carinæ	2932		1881		3179		606	9	31 1	13	-46	26.9
*36	Ursa Major	3031	81	1949		649	369	617	9	46 2	23	+69	38.8
37	Ursa Major	3034	82	1950	79 iv.		369	617	9	46	27	+70	20.8
38	Carina	3114		2007		3224		623	9	59	8	-59	35.4
**39	Sextans	3115		2008	163 i.	668	373	624	9	59 4	15	- 7	11.3
40	Hydra	3242		2102	27 iv.	3248	378	643	Wile	UTX	25	-18	5.1
1 0			363										6 -
**41	η Argûs	3372	•••	2197		3295	•••	658	10		47	-59	6.5
42	Centaurus	3532	•••	2308		3315		684	II		50	-58	4.7
*43	Ursa Major	3587	97	2343		838	402	692	II		19	+ 55	36.7
*44	Ursa Major	4258	•••	2841	43 v.	1175	441	796	1000	113	33	+47	54.5
*45	Coma Berenices	4382	85	2946		1242		815	12	19	49	+18	47.9
*46	Virgo	4472	49	3021		1294	447	825	12	24	8	+ 8	36.3
*47	Virgo	4501	88	3049		1312	448	831	12	26	26	+ 15	1.9
48	Coma Berenices	4631		3165	42 V.	1397		853	12	36	50	+ 33	8.8
*49	Canes Venatici	4736	94	3258		1456	459	867	12		43	+41	43.3
*50	κ Crucis	4755		3275		3435		870	12	47	7	-59	45.2
*51	Coma Berenices	4826	64	3321		1486	467	879	12	51	19	+ 22	16.9
*52	Coma Berenices	5024	53	3453		1558	474	897	13	7	30	+ 18	45.3
*53	Canes Venatici	5055	63	3474		1570	476	901	13	10	53	+42	36.7
**54	ω Centauri	5139		3531		3504		908	13	20	10	-46	44.3
**55	Canes Venatici	5194	51	3572		1622	484	913	13	25	13		45.2
**56	Canes Venatici	5272	3	3636		1663	492	928	13	37	3	+ 28	55.3
**57	Libra	5904	5	4283		1916	538	1023	15		57	+ 2	30.1
*58	Scorpio	6093	80	4173		3624	564	1080	16		26	-22	43.2
**59	Scorpio	6121	4	4183			569	1089	16	16	53	- 26	14.8
**60	Hercules	6205	13	4230		1968	585	1115	16		45	+ 36	- 10
*61	Hercules	6210		4234		1970	587	1118	16	39	51	+ 24	0.0
**62	Ophiuchus	6218	12	4238		1971	590	1121	16	41	31	- I	45.9
*63	Ophiuchus	6254	10	4256		1972	595	1136	16	51	22	- 3	56.8
*64	Scorpio	6266	62	4261		3661	596	1139	16			-29	55.4
*65	Ophiuchus	6273	19	4264		1975	597	1141	16	55	48	- 26	6.9

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No.	Description.
8	TO THE REPORT OF THE PARTY OF T
31	Large loose cluster, fully 20' in diameter.
32	Loose bright cluster of stars, 9 to 13 mag.; double star in centre 4" dist.
33	The fine cluster "Præsepe."
34	Large cluster of small stars, 10 to 15 mag.
35	Large rich cluster, upwards of 1° in diameter.
36	Bright elliptical nebula, 15' long, 6' wide ±. In same field is M 82.
37	Long narrow nebula, a bright ray, 7' long, 1' wide ±. In same field is M 81.
38	Large loose cluster.
39	Long narrow nebula, 5' long, 40" wide ±; a flashing stellar nucleus.
40	Very bright planetary nebula, 32" diameter; bluish.
41	A very large and remarkable nebula.
42	Large scattered cluster.
43	Large planetary nebula, $3\frac{1}{2}'$ to $4'$ diameter.
44	Large bright elongated nebula, with stellar nucleus.
45	Round nebula; with attentive gaze, perhaps bi-nuclear; rather faint,
46	Round nebula, which becomes suddenly much brighter in the centre.
47	Large elliptical nebula, rather faint.
48	Very elongated nebula, rather faint, $15'$ long \pm , with a star close to its edge in the centre of its length.
49	Bright, large, round nebula; resolvable. Much brighter in centre.
50	Rich loose cluster, containing many coloured stars,
51	Very large, bright, elliptical nebula, with stellar nucleus.
52	Very large, very fine, globular cluster of 12-mag. stars; 3' diameter; very compressed.
53	Large oval nebula; rather faint, with small brightish nucleus.
54	Fine globular cluster.
55	Remarkably singular double neb., the larger $6'$ diam, \pm , and ring-shaped. Spiral neb.
56	[Very superb globular cluster of 11-mag. stars, very condensed; brighter than, but not so large as 13 M.
57	Very bright superb globular cluster of stars, 11 to 15 mags.; very compressed.
58	Globular cluster of 14-mag. stars (<i>Herschel</i>): a round bright nebula in ordinary telescopes.
59	Rather loose cluster, compressed in centre, but dim. Precedes a Scorpii by about $1\frac{1}{2}$.
60	Large superb globular cluster of stars, 11 to 20 mags. One of the finest of its class.
61	Small bright planetary nebula, 8" diameter. Cobalt-blue colour.
62	Fine globular cluster of small stars, 10 mag., much compressed.
63	Fine large globular cluster of small stars, 10 to 15 mags., much compressed.
64	Large bright globular cluster of very small stars, 14 to 16 mags.
65	Bright globular cluster of very small stars, 16 mag., very compressed.

No.	Name or		Name or Synonym in various Catalogues. R.A. 1890.										
	Constellation.			1		1		1				1890.	
97310		D	M	H	Ĥ	h	S	S&C	h. n	n. s.	0	,	
*66	Ophiuchus	6333	9	4287		1979	609	1163	17 1	2 37	-18	24.2	
**67	Hercules	6341	92	4294			611	1165	17 1	3 46	+ 43	15.1	
68	Ara	6397		4311		3692		1185	17 3	I 43	-53	36.3	
*69	Ophiuchus	6402	14	4315		1983	621	1184	17 3	I 50	- 3	I I • 2	
*70	Ophiuchus								17 3	9 35	+ 5	45.2	
*71	Ophiuchus	6494	23	4346		1990	626	1203	17 5	0 28	-18	58.9	
*72	Sagittarius	6514	20	4355	10,11,12 V. 41 V.	1991		1210	17 5	5 41	-23	1.8	
*73	Sagittarius	6523	8	4361		3722		1214	17 5	7 8	-24	22.6	
*74	Draco	6543		4373.	37 iv.		635	1217	17 5	8 35	+66	38.0	
**75	Scutum Sobieskii	6603	24	4397		2004	642	1238	18 1	I 44	-18	26.8	
*76	Scutum Sobieskii	6611	16	4400		2006	643	1239	18 1	2 34	-13	49.7	
*77	Scutum Sobieskii	6613	18	4401		2007	644	1240	18 1		-17	10.8	
**78	Scutum Sobieskii	6618	17	4403		2008	645	1242	18 1.	4 16	-16	14.9	
**79	Sagittarius	6656	22	4424		2015	654	1257	18 2	9 28	-23	59.4	
**80	Antinous	6705	11	4437		2019	664	1280	18 4.	5 13	- 6	24.1	
**81	Lyra	6720	57	4447		2023	669	1287	18 4	9 28	+ 32	53.6	
*82	Lyra	6779	56	4485		2036	688	1321	19 1	2 16	+ 29	59.3	
*83	Sagittarius	6838	71	4520		2056	725	1372	19 4	8 49	+ 18	29.6	
**84	Vulpecula	6853	27	4532		2060	729	1377	19 5	4 48	+ 22	25.0	
85	Capricornus	6981	72	4608		2090	766	1446	20 4	7 24	— I 2	56.6	
86	Aquarius	7009		4628	ı iv.	2098	774	1459	20 5	3 10	-11	47.7	
**87	Pegasus	7078	15	4670		2120	785	1484	21 2	4 38	+11	40.3	
**88	Aquarius	7089	2	4678		2125	787	1489	21 2	7 44	- I	19-1	
*89	Capricornus	7099	30	4687		2128	791	1493	21 3	1 7	-23	39.0	
*90	Lacerta	7243		4773	75 viii.	2155	807	1526	22 11		+49		
*91	Cepheus	7654	52	4957		2238	837	1575	23 19	21	+60	59.5	
**92	Andromeda	7652		4964	18 iv.	2241		1577	23 20	35	+41	55.5	
**93	Cassiopeia	7789		5031	30 vi.	2284	847		23 51	35	+ 56	6.2	
1				NS 4		Same		420					
	S. SERVICE WAS A SERVICE OF	J. 18 15	770		1 B	34 32	12						
			1	1		2 5				70			
4		-											
			S40 .					578					
158		1	The second							3/3			
1						4 19							
			30			= 3.33		THE PARTY OF THE P				= 0	

No.	Description.
66	Bright globular cluster of small stars, 14 mag., 2' diameter ±.
67	Magnificent globular cluster of small stars, condensed in centre.
68	Globular cluster.
69	Fine large globular cluster of small stars, 15 to 16 mags., 4' diameter ±.
70	Large group of bright stars, closely nf \(\beta \) Ophiuchi. B. A. C. 6012.
71	Interesting group of small stars.
72	An open cluster of stars, superposed upon a singular trifid nebulous mass. Requires a large telescope.
73	Irregular cluster with nebula adjoining. A pretty low-power field.
74	(Brilliant small planetary nebula, cobalt-blue colour; stellar nucleus; flashing light; very singular. Gaseous (?). Really requires a large aperture.
75	very singular. Gaseous (?). Really requires a large aperture. Globular cluster of small stars, 15 mag., in a superb field of stars.
76	A loose cluster with nebulous background.
77	Very rich field.
78	The "Horse-shoe" nebula. In ordinary telescopes more the shape of a swan.
79	Fine large globular cluster of stars, 11 to 15 mags.
80	Exceedingly beautiful aggregation of small stars of about 11 mag.
81	The annular nebula in Lyra, midway between β and γ .
82	In a fine field; a globular cluster of small stars, 11 to 14 mags., 3' diameter.
83	Cluster of small stars, 11 to 16 mags., 3' diameter ±.
84	The "Dumb-bell" nebula; oval in shape; major axis 9' long, minor axis $5' \pm .$
85	Large mass of very small stars, 3' diameter. A globular cluster.
86	Small bright planetary nebula, stellar nucleus, blue colour. Similar to No. 74.
87	Fine globular cluster of very small stars, 5' diameter ±, much compressed in centre.
88	Fine globular cluster of very small stars, $5'$ diameter \pm .
89	Globular cluster of small stars, 12 to 16 mags., 2' diameter ±, rather faint.
90	A magnificent field of stars.
91	An irregular cluster of stars, 9 to 13 mags., of no great interest.
92	A very bright planetary neb., 12" diam. ±; cobalt-blue colour; flashing light. Gaseous (?).
93	A superb cluster of small stars and star dust, 11 to 18 mags.
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PART III.—MISCELLANEOUS OBJECTS.

The following list contains objects which are not within the scope of the two foregoing sections; to wit, coloured and variable stars of large or considerable magnitude, and, in the case of variables, of short periods:-

No.	Name.	R.A. 1890.	Decl. 1890.	Mag.	Notes.							
1	— Piscium	h. m. s.	o ' + 25 II.2	7	Fiery red *.							
2	R Sculptoris	1 21 54	-33 7.3	6	Beautiful orange-red *.							
3	31 Birm. Cassiopeiæ	I 47 44	+69 39.8	8	Fiery red *.							
4	o Ceti	2 13 47	- 3 28.6	var.	Max. 2; generally invisible at minimum. Period 330d. Fiery red at max.							
5	41 Birm. Persei	2 14 15	+ 56 38.2	9	Fiery red *. In a grand field.							
*6	a Ceti	2 56 31	+ 3 39.5	21/2	Fine orange *, with a blue neighbour in the field to the N.							
*7	β Persei	3 I 2	+40 31.9	var.	Max. 2; min. 4; period, 2 ^d 20 ³ / ₄ h.							
8	65 Birm. Camelopardi	3 32 21	+62 17.4	7	Pale crimson *.							
9	W. B. IV. 585 Eridani	4 29 8	- 9 10.3	6	Fiery red *.							
10	82 Birm. Aurigæ	4 38 7	+ 32 42.8	83	Pale crimson $*$: large orange $*$ p .							
**11	85 Birm. Aurigæ	4 44 37	+ 28 20.2	8	Unmistakeably crimson *.							
12	5 Orionis	4 47 38	+ 2 19.5	$5\frac{1}{2}$	Deep orange *. "Probably var."							
**13	R Leporis	4 54 36	-14 58.2	var.	Max. 6; min. 9; period 438d; an intense crimson *.							
14	899 H. P. Orionis	4 59 43	+ 1 1.5	7	Intense fiery red *.							
15	- Leporis	5 6 38	-12 1.2	71/2	Deep red *.							
	The state of the s											
16	10149 Lal. Aurigæ		+ 29 49.5	8	Almost pale ruby *.							
17	Arg. +7: 929 Orionis	5 27 16	+ 7 3.6	73	Very red *.							
18	124 Birm. Pictoris	5 40 8	-46 30.5	8	Vivid red *.							
19	U Orionis	5 49 17	+20 9.6	$6\frac{1}{2}$	Fiery red *. Period ± 365 ^d .							
20	5 Lyncis	6 17 12	+ 58 28.7	$5\frac{I}{2}$	Fiery red *. In a striking group.							
*21	144 Birm. Geminorum	6 19 11	+ 14 46.8	7	Reddish yellow *.							
22	- Canis Majoris			8	Pale crimson *.							
**23	2130 B. A. C. Aurigæ	6 28 59		6	Deep fiery red *.							
24	μ Canis Majoris		-13 54.0	51	Fiery red *.							
25	165 Birm. Monocerotis			8	Crimson *.							

No.	Name.	R.A. 1890.	Decl. 1890.	Mag.	Notes.
		h. m. s.	0 ,		
26	14776 Lal. Puppis	7 28 44	-14 17.0	5	Fiery red *. Brilliant field p.
27	16320 Lal. Hydræ	8 14 21	+ 3 6.6	$8\frac{1}{2}$	Very red *.
28	17576 Lal. Cancri	8 49 11	+17 390	7	Pale crimson *.
29	3121 B. A. C. Argûs	9 3 13	-25 24.6	434	Deep red *. ∫Max. 5; min. 10; period, 312 ^d :
**30	R Leonis	9 41 39	+11 56.5	var.	pale crimson *.
31	2874 Brisb. Antliæ	10 7 5	-34 46.7	7	Scarlet *.
32	3630 B. A. C. Antliæ	10 30 20	-38 59.9	61/2	"Orange, almost scarlet *."
33	3637 B. A. C. Hydræ	10 32 7	-12 48.7	6	Fiery red *. "Var."
*34	20918 Lal. Hydræ	10 46 16	-20 37.9	7	"Copper red *: most magnificent."
35	R Crateris	10 55 8	-17 44.0	var.	{Red *; follows a 42½ and 1' S. Max. 8; min. 9.
**36	277 Birm. Virginis	12 19 37	+ 1 22.7	81	Good crimson *: "Var."
37	4287B.A.C.Can.Venat.	12 39 57	+46 2.4	51/2	"Deep orange brown *."
38	291 Birm. Crucis	12 40 58	-59 5.6	81/2	Intense blood-red *; in the field with β Crucis, a white *.
39	298 Birm. Draconis	12 52 5	+66 35.3	7	Pale crimson *.
*40	328 Birm. Boötis	14 19 14	+ 26 12.2	7 1/2	Vivid red *.
			e Relationer		
**41	β Libræ	15 11 5	- 8 58.6	2 1/2	Beautiful pale-green *.
42	347 Birm. Apodis	15 14 3	-75 32.0	7	"Very high red *."
43	39 Libræ	15 30 21	-27 46.2	4	Decided red *.
**44	a Scorpii	16 22 39	-26 11.2	I	Fiery-red *: double dist. 3".
**45	410 Birm. Ophiuchi	17 23 14	-19 23.1	8	Very decided red *.
46	W. B. XVII. 912 Ophi.	17 46 57	+ 1 20.4	61/2	Fiery red *. Fine field.
*47	422 Birm. Ophiuchi		+ 2 44.0	$7\frac{1}{2}$	Reddish *. "? Var."
**48	Arg. + 36: 3168 Lyræ	18 28 30	+ 36 54.5	8	Decided crimson *. "? Var."
49	464 Birm. Scuti	18 43 57	- 8 1.9	8	Rich fiery red *. "? Var."
50	35611 Lal. Aquilæ	18 58 32	- 5 50.9	71/2	Very fine fiery red *. "? Var."
1	Windson State				
51	4 Vulpeculæ	19 20 38	+19 35.0	54	Orange *: fine field.
52	Arg. + 45: 2906 Cygni	19 25 21	+45 48.9	8	Pale crimson *. "? Var."
53	6702 B.A.C. Draconis	19 25 30	+ 76 21.1	61/2	Strong fiery red *. "? Var."
54	36981 Lal. Sagittarii	19 28 0	-16 36.8	7	Deep red *. ? Var. in colour.
*55	6769 B.A. C. Cygni	19 40 16	+40 26.6	6	Fiery red *.
56	χ Cygni	19 46 20	+ 32 38-2	var.	Max. 4; min. 0; period, 406d. Fiery red when approaching max.
57	η Aquilæ	19 46 52	+ 0 43.4	var.	Max. 3.6; min. 4.7; period, 7.17d.
*58	526 Birm. Sagittarii	20 0 12	-27 32.5	7	Deep red *.

			display and		
No.	Name.	R.A. 1890.	Decl. 1890.	Mag.	Notes.
*59 60	545 Birm. Capricorni U Cygni	h m. s. 20 10 40 20 16 12	° , -21 38.3 +47 32.9	7½ var.	Decided red *. Max. 7; min. 11<; period, 461 ^d . Very red *: in striking contrast with a blue * nf.
61 62 63 **64	61 P. XXI, Cephei 8745 Lac. Indi 589 Birm. Cygni 592 Birm. Cygni	21 14 19 21 37 23 21 38 43	+59 38.6 -70 11.7 +35 0.4 +37 30.7	7 ¹ / ₂ 6 7 8	Remarkable fiery red *. "? Var." Ruby-orange *. Unmistakeable fiery red *. Deep fiery red *. [Max. 4; min. 6; period, 5 or 6]
**65 **66 *67 68	μ Cephei 42431 Lal. Aquarii Arg. + 65: 1691 Cephei δ Cephei		+ 58 16.5 - 2 43.4 + 65 37.6 + 57 51.1	var. $6\frac{1}{2}$ $6\frac{1}{2}$ var.	years: "very fine deep garnet." Decided red *. Fiery red *. Blue * 6½ mag. near, p. [Max. 3¼; min. 4½; period, 5.36d.] Orange * with blue comes.
69 70 71 **72	Arg. + 57: 2562 Cephei 8 Andromedæ 19 Piscium R Cassiopeiæ	22 30 23 23 12 38 23 40 45 23 52 49	+ 57 36·1 + 48 24·9 + 2 52·5 + 50 46·5	7½ 5 5½ var.	Fiery red *. Fiery red *. Decided red *. "? Var." Max. 5; min. 12; period, 430d.
**73 *74	6259 Rad. Cassiopeiæ 30 Piscium	23 55 39 23 56 19	+ 59 44·5 - 6 37·5	8 4½	Vivid red *. Very fiery red *. 9 th mag. blue * near. Fiery red *.
	Chair and State				
	1951	dir i			

CHAPTER XI.

A CATALOGUE OF VARIABLE STARS.

PART I.—KNOWN VARIABLES.

IN the Astronomical Register, vol. ii. p. 194, August 1864, I published a Catalogue of Variable Stars, based upon the latest information then accessible; that Catalogue was copied into various publications, English and foreign, and a revised and enlarged version of it was published in Month. Not., vol. xxv. p. 208, May 1865. The present Catalogue may be considered an extension of the latter.

As regards the Catalogue itself, the headings of the columns are sufficiently explicit, and it is only necessary to state that the symbol < signifies that the star's minimum magnitude fell below that given, but how much is unknown.

Various stars suspected to be variable have been formed into a sub-class by themselves.

Argelander's very crude and unsatisfactory nomenclature a has been followed, but at no very distant period it will have to give place to something more artistic.

I have to thank Mr. J. Baxendell and Mr. G. Knott for much important assistance in revising this Catalogue up to date.

In revising the Catalogue for the present edition of this work the following sources of information are amongst those which have been made use of:—

- 1874. Schönfeld, Zweiter Catalog der Veränderlichen Sterne. 8vo. Mannheim.
- 1884. Gore, J. E., Catalogue of Known Variable Stars. (Proceedings Roy. Irish Acad., 2nd Ser., vol. iv. p. 149.)
- 1885. Gore, J. E., Catalogue of Suspected Variable Stars. (Proceedings Roy. Irish Acad., 2nd Ser., vol. iv. p. 267.)
- 1888. Gore, J. E., Revised Catalogue of Variable Stars. (Proceedings Roy. Irish Acad., 3rd Ser., vol. i. p. 97.)
- 1888. CHANDLER, S. C., Catalogue of Variable Stars. (Astronomical Journal, vol. viii. p. 81. Sept. 6, 1888.
- 1889. Pickering, E. C., Index to Observations of Variable Stars. (Annals of Harvard College Observatory, vol. xviii. part VIII. p. 244.)

a Ast. Nach., vol. xl. No. 959. May 3, 1855.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.	
		h. m. s.	0 ,	Days.	From to		
I	T Ceti	0 16 12	-20 40.3	65?	5 7	Chandler 1881	
2	T Cassiopeiæ	0 17 17	+ 55 10.9	441	61/2 12	Krüger 1870	
3	R Andromedæ	0 18 13	+37 58.0	411	51/2 13<	Argelander 1858	
4	S Ceti	0 18 27	- 9 56.3	323	7 121/2	Borrelly 1872	
5	B Cassiopeiæ	0 18 41	+63 32.2	23.200		Tycho Brahe 1572	
6	T Piscium	0 26 17	+ 13 59.6	Irreg.	91 11	R. Luther 1855	
7	Nova Androm.	0 36 43	+40 39.9		7 14<	I. W. Ward 1885	
8	V Cassiopeiæ	0 40 13	+47 39.3	260 <u>+</u>	712 14?	Espin 1887	
9	U Cephei	0 52 32	+81 16.9	2.49+	$7 9\frac{1}{2}$	Ceraski 1880	
10	S Cassiopeiæ	1 11 35	+72 2.0	607	63 131<	Argelander 1861	
11	S Piscium	1 11 48	+ 8 21.1	406	8 13<	Hind 1851	
12	U Piscium	1 17 8	+12 17.4	330	10 14<	Peters 1880	
13	R Sculptoris	1 21 54	-33 6.8	207 ?	53 73	Gould 1872?	
14	R Piscium	I 24 58	+ 2 18.8	345	7 13<	Hind 1850	
15	S Arietis	1 58 44	+11 59.9	290	9 14?	C.H,F.Peters 1865	
16	R Arietis	2 9 52	+ 24 32.7	187	$7\frac{1}{2}$ $13\frac{1}{2}$	Argelander 1857	
17	T Persei	2 11 28	+ 58 26.5	Irreg.	8 91/2	Safarik 1882	
18	o Ceti	2 13 47	- 3 28.7	331	13 10<	D. Fabricius 1596	
19	S Persei	2 14 57	+ 58 5.0	346	8 121	Krüger 1873	
20	R Ceti	2 20 26	- 0 40.4	167	$7\frac{1}{2}$ $13\frac{1}{2}$	Argelander 1866	
		100					

1. A star of the same type as the long-known variable R Scuti.

2. Increase of light less rapid than the decrease. At times a very red star. An 8th mag. star follows 10s and 0.5' to the N.

3. At max. the star's light fluctuates but little for 2 or 3 weeks.

4. Schönfeld finds the increase quicker than the decrease.

5. This is Tycho's celebrated star as placed by Hind. An 11th mag. star thought to show signs of variability is still there. (See Cycle, p. 679.)

7. This is the temporary star which suddenly appeared in August 1885 in the great nebula in Andromeda (31 Messier).

8. Chandler calls this U Cassiopeiæ.

9. This is a very remarkable star. It remains at its maximum for the greater part of its period, the decrease and increase being together accomplished in the short space of 6h. Sometimes it varies a whole magnitude in one hour.

10. Light increases more quickly than it decreases. A 9½ mag. star follows 20s

and 2' to the S.

13. "One of the most brilliantly-coloured stars in the heavens." (Gould.)

14. Light increases more quickly than it decreases. There is an 11th mag. star nf.

15. Observers differ as to the period.

16. Period well determined. From max. to min. the interval is 99^d; and from min. to max. 88d.

18. Described in detail in Chap. III. (ante).

19. There is a 10th mag. star nf.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.
	MESTERS N	h. m. s.	0,	Days.	From to	
2 I	U Ceti	. 2 28 25	-13 37.8	233	$6\frac{3}{4}$ $10\frac{1}{2}$	Sawyer 1885
22	T Arietis	. 2 42 11	+ 17 3.2	323	8 9½	Auwers 1870
23	ρ Persei	. 2.58 7	+ 38 24.9	33? or irreg.	$3\frac{1}{2}$ $4\frac{1}{4}$	Schmidt 1854
24	β Persei	. 3 1 1	+ 40 31.9	2.86	21/4 4	Montanari 1669
25	R Persei	. 3 23 3	+ 35 17.7	212	$\left\{ 7^{\frac{3}{4}} 13^{\frac{1}{2}} \right\}$	Schönfeld 1861
26	. m:			0		7 1.11 10.0
26	λ Tauri		+ 12 10.8	3.95 or 3.38		Baxendell 1848
27	T Tauri		+19 16.5	Irreg.	$9^{\frac{1}{4}}$ $13^{\frac{1}{2}}$?	Hind 1861
28	W Tauri	4 21 45	+ 15 51.4	275±	8 13	Espin 1886
29	R Tauri	4 22 17	+ 9 55.0	325	$7\frac{1}{2}$ $13\frac{1}{2}$	Hind 1849
30	S Tauri	. 4 23 11	+ 9 42.2	378	$9^{\frac{1}{2}}$ $13^{\frac{1}{2}}$	Oudemans 1855
31	R Reticuli	4 32 23	-63 15.4	281	7 13<	Chary 1867
32	R Doradûs	4 35 28	-62 17.6		$5\frac{1}{2}$ $6\frac{3}{4}$	Thome (Gould) 1874?
33	V Tauri	4 45 40	+17 21.1	169	81/2 131/2	Auwers 1871
34	R Orionis	4 52 59	+ 7 57.7	379	83 13<	Hind 1848
35	ε Aurigæ	4 54 2	+43 39.7	Irreg.	3 41/2?	Fritsch 1821
.6	D.T		0 -		6 012	01 11 2022
36	R Leporis	1		436	6 8½?	Schmidt 1855
37	R Aurigæ	. 5 8 25	+ 53 27.7	460	6½ 13	Argelander 1862
38	S Aurigæ	. 5 19 52	+ 34 4.2	or irreg.	94 14<	Dunér 1881
39	S Orionis	. 5 23 34	- 4 47.0	413±	81/2 13<	Webb 1870
40	δ Orionis	. 5 26 23	- 0 22.9	Irreg.	21/4 23/4	Sir J. Herschel 1834

23. Period irregular.

24. Described in detail in Chap. III. (ante).

- 25. Sometimes at its min. this star remains almost without change for 2 months. 26. The fluctuations of light are for the most part accomplished in about 10h. 27. In immediate proximity, to the nf, of D'Arrest's var. neb. (See Chap. V. ante.)

30. Only for about 70d of its period is this star brighter than 12th mag.

32. "Excessively red."-(Gould.)

33. A 121 mag. star follows.

34. The decrease of light is less rapid than the increase.

35. Schönfeld thinks that there is no regular period and that the variation is often for a long period imperceptible.

36. This is Hind's celebrated "crimson star." It well deserves all that has been said of it. (See Cycle, No. 281.)

37. A red star. About 114d before max, the light remains unchanged at 9th mag. for about 48d. The increase from 8½ mag. lasts 40d, and the decrease 62d.

38. A very red star.

39. Very red. Webb says:-"Centre of little triplet, 11, 11.5 in large triangle; sweep 61m W. from minute pair 10' N. of 42."

40. Schönfeld finds no regular period, but Auwers suggests 16d, with min. nearly

in middle interval of 2 max.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.		nge of nitude.	Discoverer.	
		h. m. s.	0 ,	Days.	From	to		1 1 3 1
41	T Orionis	5 30 26	- 5 32.8		93	13	Bond	1863
42	a Orionis	5 49 13	+ 7 23.1	Irreg.	I	I <u>I</u>	Sir J. Hersche	1 1840
43	U Orionis	5 49 17	+ 20 9.4	365 ±	6	12<	Gore	1885
44	η Geminorum	6 8 13	+ 22 32.3	140± ?	3	4	Schmidt	1865
45	V Monocerotis	6 17 10	- 2 8.3	. 334	7	101/2	Schönfeld	1833
					146	The same	MIE SON	4500
46	T Monocerotis	6 19 17	+ 7 8.7	26.8	5 3 4	81	Davis	1871
47	R Monocerotis	6 33 10	+ 8 50.0	Irreg.	91/2	13 </td <td>Schmidt</td> <td>1861</td>	Schmidt	1861
48	S (15) Monoc.	6 34 58	+ 9 59.7	3.4 ?	5	5 1/2	Winnecke	1867
49	R Lyncis	6 52 13	+ 55 29-2	380	8	13<	Krüger	1874
50	ζ Geminorum	6 57 35	+ 20 43.9	10.16	33.	$4\frac{I}{2}$	Schmidt	1847
					31,13			
51	R Geminorum	7 0 43	+ 22 52.4	371	61	131<	Hind	1848
52	R Canis Minoris	7 2 40	+10 11.9	337	7	10	Argelander	1855
53	L ² Puppis	7 10 12	-44 27.7	136	31/2	64	Gould	1872
54	R Canis Majoris	7 14 29	-16 11.1	1.13	6	63	Sawyer	1887
55	V Geminorum	7 16 59	+13 18.1	276	81	14	Baxendell	1880
300	A CONTRACTOR OF THE PARTY OF TH			9-39-59	1 1 1 3 1		THE PARTY OF	

41. In the Great Nebula of Orion.

42. In spite of Sir J. Herschel having been confirmed in 1852 by Fletcher, there seems great doubt about the variability of this star. J. F. J. Schmidt's testimony is emphatically in the negative.

43. A fine red star.

44. At max the fluctuations appear to be irregular, but at min. fairly gradual. This has been found by Burnham to be double, the companion being of mag. 9 at a distance of about 1".

46. Schönfeld suggests that the coincidence of the period with the lunar month influences the observations made on the star. Colour golden yellow. The max.

occurs 8d after the min.

47. Schönfeld thinks that no regular period exists, and that the magnitude at min. is uncertain. Close to the neb. 2 HI IV. (See Ast. Nach., vol. lv. No. 1302, April 6, 1861.)

48. Period uncertain. The principal star in the cluster 5 H VIII. (See Cycle, No. 424.) Has a companion at 139.2°: 75.7", which is stated to be also variable.

49. A red star.

50. Light decreases somewhat more quickly than it increases. Pickering suggests that the star presents to us a surface of revolution, one side being about 4 the brightness of the other.

51. Light curve very irregular. Stated by Hind and also by Pogson to be remarkably variable in colour. Most interesting bright lines spectrum at maximum, according to Secchi.

53. At epoch of max. the fluctuations of light are rapid; at min. comparatively slow. A very red star.

54. A star of the Algol type.

55. Increase and decrease of brightness nearly equal. An III mag. star sf.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.	
		h. m. s.	0 /	Days.	From to		
56	U Monocerotis	7 25 32	- 9 32.8	31 ? or 45 ?	6 8	Gould 1873	
57	S Canis Min	7 26 44	+ 8 33.2	332	74 131	Hind 1856	
58	T Canis Min	7 27 53	+11 58.7	322	9 131<	Schönfeld 1865	
59	U Canis Min.	7 35 22	+ 8 39.2	425	8 13	Baxendell 1879	
60	S Geminorum	7 36 26	+ 23 42-7	294	81 131<	Hind 1848	
152							
61	T Geminorum	7 42 42	+ 24 0.5	288	8 131/2	Hind . 1848	
62	S Puppis	7 43 32	-47 50.5		74 9	Gould 1872?	
63	U Geminorum	7 48 34	+ 22 17.5	Irreg., 86?	9 14<	Hind 1855	
64	U Puppis	7 55 40	-12 33.7	310	81 14<	Pickering 1881	
65	R Cancri	8 10 30	+12 3.8	354	6 113<	Schwerd 1829	
	The second						
66	V Cancri	8 15 27	+17 38.2	272	7 12<	Auwers 1870	
67	U Cancri	8 29 28	+ 19 16.5	306	81 14<	Chacornac 1853	
68	S Cancri	8 37 39	+ 19 25.9	9-48	8 111	Hind 1848	
69	S Hydræ	8 47 49	+ 3 29 1	256	$7\frac{1}{2}$ $13\frac{1}{2}$	Hind 1848	
70	T Hydræ	8 50 19	- 8 43·I	289	61 13<	Hind 1851	
	E TO LOUIS OF		Frank Barrier				

56. Gould suggests a period of 46d; Espin of 31d.

57. At maximum the light fluctuates very little for a week. A yellowish red star.

58. Below 13 mag. during a large part of its period. There is a 12 $\frac{3}{4}$ mag. star sp, and a 12 $\frac{1}{4}$ mag. star sf.

59. A double-period variable.

60. The fluctuations of light are rapid, especially between min. and max.

61. Schönfeld says that the average period is sometimes as much as 13.7d out. The progressive increase in the light between min. and max, is often checked at

mag. 92.

63. The period of this star is subject to great variations. Schönfeld thinks that the period may range between 70^d and 150^d. The visibility at max. usually lasts either 10^d or 20^d, there being two distinct types of maxima. At the max. of November 1858, Baxendell found that the star "had a somewhat hazy or nebulous appearance." The star rises at times 3 magnitudes in 24^h; the fall is much less rapid.

65. Schönfeld thinks that the period is increasing. Light increases more quickly

than it decreases. There is a 10th mag. star sf.

66. A yellowish red star. There is an 11^{th} mag, star f on the parallel, and a $10\frac{1}{2}^{5}$ mag, star sf.

67. For a month before and after max, the increase and decrease of light are

nearly equal.

68. A star of the Algol type. The decrease lasts $8\frac{1}{2}h$, and the increase 13^h . The progressive increase in the light between min. and max. is in a marked degree retarded at $9\frac{1}{2}$ mag. An 11^{4h} mag. star p, nearly on the parallel.

69. A reddish yellow star.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer.	
177		h. m. s.	0 /	Days.	From to			
71	T Cancri	8 50 23	+ 20 16.1	483	8	101	Hind 1850	
72	R Carinæ	9 29 28	-62 18.1	312	41/4	10	Gould 1871	
73	R Leonis Min.	9 38 59	+ 35 1.2	373	6	121<	Schönfeld 1863	
74	R Leonis	9 41 39	+11 56.5	314	5	$11\frac{1}{2}$	Koch 1782	
75	l Carinæ	9 42 13	-62 O·I	31.0	334	54	Gould 1871	
	T. T.		51 7				D 1	
76	V Leonis	9 53 57	+21 47.2	280 ?	81/2	131/2	Becker 1882	
77	R Antliæ	10 5 2	-37 11.5		$6\frac{1}{2}$	8<	Gould 1872	
78	S Carinæ	10 5 51	−61 0.7	several mos.	64	9	Gould 1871	
79	U Leonis	10 18 10	+ 14 33.6		$9\frac{1}{2}$	131<	Peters 1876	
80	U Hydræ	10 32 7	-12 48.8	195	44	$6\frac{1}{2}$	Gould 1871	
81	R Ursæ Majoris	10 26 51	+69 21.2	302	6	131	Pogson 1853	
82	η Argûs	10 40 47	-59 6.5	70 yr. + ?	I		Burchell 1827	
83		10 46 17	-20 40.0	-	6	71/2		
84	TYT T	1300		575±	1	9<	STATE OF THE STATE	
	_ ~		+14 18.0	395	9?	14<	Peters 1880	
85	T Carinæ	10 50 53	-59 56.0	•••	6	7	Thome 1872	
86	R Crateris	10 55 8	-17 44.0	160 }	8	9<	Winnecke 1861	
87	S Leonis	11 5 10	+ 6 3.7	188 ?	9	13<	Chacornac 1856	
88	T Leonis	11 32 48	+ 3 58.9	29	10?	14<	C.H.F.Peters 1862	
89	X Virginis	11 56 13	+ 9 41.1		7	12	C.H.F.Peters 1871	
90	R Comæ	11 58 37	+19 23.8	363	$7\frac{1}{2}$	131/2	Schönfeld 1856	

71. A very red star.

72. A red star; or, as Sir J. Herschel has it, "between scarlet and carmine red." Gould's averages make the period about 320d.

73. Light increases more quickly than it decreases. The increase from mag. 9 to max. occupies from 40d to 80d. A red star.

74. One of the best known long period variables. "A fine rich ruby star." (MS. Jan. 20, 1865.)

78. A reddish star.

80. "Intensely orange red."—(Gould.)

81. Increase of light to max. takes 3 months less time than the decrease to min. In 1876 it rose from mag. 13 to max. in 28d, but it occupied 112d in passing from max. to invisibility.

82. For a full account of this see Chap. V. (ante).

83. An intensely red star.

86. Usually a very red star. Schönfeld suggests a period of 160° . Follows a Crateris 43° , and $1\cdot 2'$ to the S. A 10° h mag. star p, and there is a 9° h mag. star sf. 88. Not seen by Schönfeld since 1866, excepting perhaps in Feb. 1874.

89. Seen by Schönfeld March 1873 and Feb. 1874, but not since. A 12th mag.

star 7. 28.

90. Owing to the near coincidence of the period of this star with the solar year it has since 1875 been unfavourably situated for observation. There is an 8th mag. star np.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.		Discoverer,	
		h. m. s.	0 /	Days.	From	to		
91	T Virginis	12 8 58	- 5 25.3	337	8 1	32<	Boguslawski	1849
92	R Corvi	12 13 56	-18 38.4	317	63 1	T 1/2 <	Karlinski	1867
93	Z Virginis	12.28 13	- 3 49.0	210 <u>+</u>	8 I	14	Henry	1874
94	β Corvi	12 28 36	-22 47.3	5/1	2 <u>I</u>	34	Smyth	?
95	T Ursæ Majoris	12 31 23	+60 5.6	257	61 1	$3\frac{1}{2}$	Argelander	1860
19 333		1000						
96	R Virginis	12 32 55	+ 7 35.7	146	$6\frac{1}{2}$ I	>11	Harding	1809
97	R Muscæ	12 35 22	-68 48.2	0.9	61/2	$7\frac{1}{2}$	Gould	1871
98	S Ursæ Majoris	12 39 7	+ 61 41.7	231	7 1	13	Pogson	1853
99	U Virginis	12 45 31	+ 6 9.1	207	71 1	13	Harding	1831
100	W Virginis	13 20 21	- 2 48.2	17.27	83 1	101	Schönfeld	1856
		76.53						
IOI	V Virginis	13 22 7	- 2 36.0	251	8 1	13<	Goldschmidt	1857
102	R Hydræ	13 23 42	-22 42.7	430±	4 1	>01	J. P. Maraldi	1704
103	S Virginis	13 27 16	- 6 37.7	374	5½ I	13	Hind	1852
104	Y Virginis	13 28 50	-12 39.0		5	8 ?	Schmidt	1866
105	RCanumVenat.	13 44 14	+40 5.3		7 1 1	13½?	Espin	1888
106	RR Virginis	13 59 3	- 8 40.2	383	11 1	14<	Peters	1880
100	Total Triginis	29 99 9	- 0 40.2	303		-1	2 00010	2000

91. "A very red star."—(Schönfeld.)

92. Light increases more quickly than it decreases. There are two 8th mag. stars and a 10th mag. star, near.

93. Chandler calls this Y Virginis, rejecting (but unreasonably as I think) the

star below, to which Gould applied the letter Y.

94. Gould and Gore both confirm Smyth as to the variability of this star.

95. Latter portion of rise to maximum is, at times, extremely rapid (Baxendell, jun.).
96. Both the epochs of maxima and the epochs of minima seem not to recur at strictly regular intervals. The light curve also exhibits irregularities.
97. Gould's period is more exactly 21^h 20^m. The max. follows the min. by 9^h.
98. The light curve is irregular. Shortly before maximum the increase of light undergoes a marked retardation, and shortly before maximum the decrease is similarly shocked. Person potes that the increase and the decrease of light takes. similarly checked. Pogson notes that the increase and the decrease of light take place in intervals of time more equal than is usual with variable stars.

99. Near the epoch of max. the light curve is very irregular. There is a 10th.

mag. star np.

101. The increase from 10th mag. to max. occupies 35d, with marked fluctuations: the decrease to the same mag. 51d, much more uniform. A yellowish red star.

102. The period has undoubtedly diminished. In 1708 it was 500d; in 1785 it was 487^d; in 1870, 437^d; and it is still diminishing at the rate of 9^h for each period according to Gould. A red star.

103. The period seems to be diminishing. The min. has been found to occur about 119d before the max. Very red at max. Stated to be subject to marked changes of

colour.

104. This is one of Burnham's close doubles. Pos. 80°; dist. 0.48"; epoch, 1879.4. The components were found by him nearly equal in magnitude.

No.	Star.	R.A.	1890.	Decl. 1	890.	Period.		nge of nitude.	Discovers	
		h. n	1. 8.	0	,	Days.	From	to		Bally
107	Z (bis) Virginis	14	4 25	-12	46.9	303	9	14<	Palisa	1880
108	R Centauri	14	8 39	-59	24.0	Probably long & irreg.	}6	10	Gould	1871
109	T Boötis	14	8 57	+19	34.9		93	14<	Baxendell	1860
110	X Boötis	14 1	8 58	+16	49.0	121	9	104	Baxendell	1859
1334		-	a library			A STATE OF THE PARTY OF THE PAR	113			
111	S Boötis	14 1	9 10	+ 54	18.6	272	734	131/2	Argelander	1860
112	V Boötis	14 2	5 18	+ 39	21.0	267	7	$9\frac{1}{2}$	Dunér	1884
113	R Camelopardi	14 2	5 55	+84	19.8	269	73	131	Hencke	1858
114	R Boötis	14 3	2 20	+27	13.0	224	6	13?	Argelander	1858
115	V Libræ	14 3	4 14	-17	10.9		9	121	Schönfeld	1882
10000		1				(Tonmand)			T STATE OF	
116	W Boötis	14 3	8 35	+ 26	59.8	Long and irreg.	5	6	Schmidt	1867
117	U Boötis	14 4	9 14	+18	8.4	174	9	131	Baxendell	1880
118	δ Libræ	14 5	5 5	- 8	4.9	2.32	5	6	Schmidt	1859
119	T Libræ	15	4 27	-19	35.8	723	10	14<	Palisa	1878
120	Y Libræ	15	5 52	- 5	35.6		81/2	?	Bauschinger	1887
1424	335 VA 4 T	1100			•	TOTAL BENE				
121	R Triang. Aust.	15	9 56	-66	5.5	3.4	61	8	Gould	1871
122	U Coronæ	15 1	3 42	+ 32	3.1	3.45	7 1/2	9	Winnecke	1869
123	S Libræ	15 1	5 4	-19	59.4	192	8	13<	Borrelly	1872
124	S Serpentis	15 1	6 30	+14	42.5	365	71/2	121 ?	Harding	1828
125	S Coronæ	15 1	6 54	+31	45.8.	360.5	6	13	Hencke	1860
- 38	Land India	10.		La Car		la Fibrary	1		STATE OF THE REAL PROPERTY.	

107. Chandler calls this simply Z. See note ante on Z Virginis (No. '93).

108. The light curve is very irregular, and the period uncertain. Gould suggests 525d with 2 intermediate maxima. ? R.A. 22s too little if star=323 Birmingham. A red star.

109. Not seen since 1860. Evidently one of the so-called temporary stars.

110. Increase of brightness takes more than twice as long as the decrease; but light curve is very irregular.

111. Period fairly certain. Light curve irregular.

113. Fluctuations of light irregular.

114. Schmidt made the period 229d.

118. A variable of the Algol type. The fluctuations of light occupy about 12h, of which $5\frac{1}{2}^{h}$ represents the decrease and $6\frac{1}{2}^{h}$ the increase.

122. A variable of the Algol type. The fluctuations of light occupy about 93h, of which 41h represents the decrease and 51h the increase.

123. Peters suggests a period of only 98d. There is a 13th mag. star np, and a

12th mag. star nf.

124. The period is uncertain or irregular. The min. occurs nearer to the following max. than to the preceding one. There is an 11th mag. star np, and a 12\frac{3}{4} mag. star nf. "A very red star."—(Schönfeld.)

125. Increase of light rapid, decrease slow.—(Sawyer.) Baxendell gives increase 126^d and decrease 234^d. Period irregular, owing to varying position of "head" on maximum portion of light curve.

No.	Star.	R.A. 1890.	Decl. 1892.	Period.	Change of Magnitude.	Discoverer.
126 127 128	T (bis) Libræ U Libræ ∫Ö-Arg. 14782	h. m. s. 15 29 50 15 31 40 15 35 38	0 / -20 48·0 -15 48·6 -20 49·5	Days. 302? 380?	From to 11? 14<	C.H.F.Peters 1878 C.H.F.Peters 1878 C.H.F.Peters 1878
129	R Coronæ V Coronæ	15 44 3 15 45 36	+ 28 29.6 + 39 54·1	irreg. 357	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Pigott 1795 Dunér 1878
131 132 133	R Serpentis R Lupi R Libræ	15 45 38 15 46 20 15 47 23	+ 15 28.0 -35 58.2 -15 54.4	358 723	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Harding 1826 Gould 1884 Pogson 1858
134 135	T Coronæ R Herculis	15 54 53 16 1 17	+ 26 14·0 + 18 40·0	319	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Birmingham 1866 Argelander 1855
136 137 138	W Scorpii V Scorpii T Scorpii	16 2 4 16 5 20 16 10 29	-21 13.9 -19 51.0 -22 42.2	405?	11 13 10 14½	C.H.F.Peters 1876 J. Palisa 1877 Auwers 1860
139	R Scorpii S Scorpii	16 11 5 16 11 6	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	225 177	7 13< 9 14< 9 13<	Chacornac 1853 Chacornac 1854
141	W Ophiuchi U Scorpii	16 15 29 16 16 8	- 7 26·2 -17 37·5	328?	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Schönfeld 1881 Pogson 1863

126. The true period may be the half of 310d. Chandler calls this X Libræ.

127. The true period may be the half of 380d. Chandler calls this W Libræ. 128. Chandler calls this U Libræ.

129. The fluctuations of light are very irregular, and all sorts of periods have been suggested. Sometimes it remains unchanged in light for a period as long as a year.

130. A red star.

131. The period is certainly irregular.

133. This star has not been much observed owing to the short duration of its max. phase. Schönfeld thinks that the period of 723d given in the table may be a multiple of the true period.

134. This is Birmingham's Nova of 1866, of which a more particular account is given in Chap. III. (ante). Regarded as a variable it has been suspected by Schmidt

and Schönfeld to undergo regular fluctuations of light in 94d. 135. The period seems to be increasing.

136. Chandler calls this X Scorpii.

137. Chandler calls this W Scorpii.

138. This is Pogson's Nova of 1860, of which a more particular account is given in Chap. V. (ante).

139. This is close to the cluster 80 M. The light curve is said by Schönfeld to be very variable.

140. This is $3\frac{1}{4}$ distant from R Scorpii. There is a $9\frac{1}{2}$ mag. star sf.

142. This has not been seen since 1863. It diminished from mag. 9 to mag. 12, between May 20 and 28. Its precise place has not been well ascertained.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.
-		h. m. s.	0 ,	Days.	From to	
143	V Ophiuchi	16 20 36	-12 10.4	307 ±	7 101	Dunér 1881
144	U Herculis	16 20 56	+19 8.6	411	61/2 13	Hencke 1860
145	g (30) Herculis	16 25 2	+ 42 7.5	40 to 125	43 61	Baxendell 1857
-		12 600	La remail	TREETER		1 - 2 - m - 2 - 1 - 2 - 1
146	T Ophiuchi	16 27 26	-15 53.8	359 ?	10 13<	Pogson 1860
147	S Ophiuchi	16 27 55	-16 55.7	234	81/4 131/2	Pogson 1854
148	V Herculis	16 31 19	+ 37 33.7	289	8 14	Dunér 1880
149	R Ursæ Min	16 31 26	+72 30.0	180?	$8\frac{1}{2}$ $10\frac{1}{2}$	Pickering 1881
150	R Draconis	16 32 21	+66 59.3	245	7 13<	Geelmuyden 1876
1283			The State of			The state of
151	S Herculis	16 46 53	+ 15 7.5	309	6 13<	Schönfeld 1856
152	Nova Ophiuchi	16 53 20	-12 43.5		4½ 13½<	Hind 1848
153	V Herculis	16 54 16	+ 35 13.9	257 or 324	9 12	Baxendell 1880
154	R Ophiuchi	17 1 27	- 15 56.6	302	$7\frac{1}{2}$ $13\frac{1}{2}$	Pogson 1853
155	a Herculis	17 9 38	+ 14 30-9	. irreg.	3 4	W. Herschel 1759
17850	The second	300000000000000000000000000000000000000		Partie and		The second
156	U Ophiuchi	17 10 56	+ 1 19.9	20 ^h	$6 6\frac{3}{4}$	Sawyer 1881
157	u (68) Herculis	17 13 15	+33 13.0	381	$4\frac{1}{2}$ $5\frac{1}{2}$	Schmidt 1869?
200	and the second					

143. A very red star.

144. A highly yellowish-red star.

145. Schönfeld calls this star g Herculis. The fluctuations of light are very irregular, but 70 or 80 days seems to be something like the mean value.

146. The observations of this star are few, and its real period uncertain.

147. The light curve is very variable. The increase and decrease of light 14d before and after max, is nearly equal; afterwards the decrease proceeds more slowly than the increase.

149. The period is probably long; 2 years or more. This star is said by Webb to be white at max, and ruddy at min. Chandler calls this W Herculis.

150. There is a 9th mag. star closely sf.

151. A very red star. A retardation in the increase of light usually occurs 1 or 2m before max. After max, the decrease is rapid. There is an 11th mag, star sf, and a 6th mag. star nf. The last is 49 Fl. Herculis.

152. This is Hind's well-known star of 1848, as to which see Chap. III. (ante). It is still visible as a 12th mag. star, having diminished year by year, especially

1856-1874.

155. The irregularities in the light of this star are so great that such diverse

periods as 7d, 26d, 103d, 111d, and 185d have been assigned.

156. A variable of the Algol type, having, moreover, the shortest known period, namely, 20h 7m 41s. It remains at its normal max. for 16h, and accomplishes all its changes in 4h.

157. Numerous irregularities appear in the light curve, especially at min. Schmidt found the extremes of variation to be, occasionally, greater than those given above, even mag. 4 on the one hand and mag. 6 on the other. Has a 10th mag. companion 4" distant.

No.	Star.	R.A. 1890.	Decl. 1899.	Period.	Change of Magnitude.	Discoverer.
E ALIV		h. m. s.	0,	Days.	From to	
158	NovaSerpentarii	17 24 3	-21 23.2			D. Fabricius 1604
159	— Aræ	17 31 5	-45 24.8		5 11	Tebbutt 1877
160	X (3) Sagittarii	17 40 37	-2747.3	7.01	4 6	Schmidt 1866
767	W (al) Societ		20.250	h *0	- 61	Sehmidt 1866
		17 58 0	-29 35.0	7.59	$5 \qquad 6\frac{1}{2}$	
162	T Herculis	The state of the s	+ 31 0.2	165	$7 13\frac{1}{2}$	Argelander 1857
163	Y Sagittarii	18 14 54	-18 54.5	5.77	$5\frac{1}{2}$ $6\frac{1}{2}$	Sawyer 1886
164	T Serpentis	18 23 27	+ 6 13.6	342	9 14?	Baxendell 1860
165	V Sagittarii	18 24 57	-18 2c·5		$7 9\frac{1}{2}$	Quirling 1865
3 3 3	SELECTION OF THE PERSON OF THE				THE REAL PROPERTY.	
166	U Sagittarii	18 25 24	-19 12.3	6.74	7 9	Schmidt 1866
167	X Ophiuchi	18 33 6	+ 8 44.0	300 <u>+</u>	6.8 9?	Espin 1886
168	T Aquilæ	18 40 26	+ 8 38.1	4 ^m ±	83 10	Winnecke 1860
169	R Scuti Sob	18 41 37	- 5 49.3	71	44 9	Pigott 1795
170	κ Pavonis	18 45 36	-67 22.2	9	4 51/2	Thome 1872
1000						
171	β Lyræ	18 46 1	+ 33 14.1	12.91	3½ 4½	Goodricke 1784
172	R (13) Lyræ	18 51 59	+43 48.0	46	4 44	Baxendell 1855
173	S Coronæ Aust.	18 53 44	-37 6.1	6.2	91/2 13	Schmidt 1866
174	R Coronæ Aust.	1	-37 6.0	31 ?	10 13<	Schmidt 1866

158. This is Kepler's celebrated star of 1604, as to which see Chap. III. (ante). The place here given is that deduced by Schönfeld from Fabricius's observations, but its exactness cannot be guaranteed. Chacornac and Winnecke have seen very close to this place a star which if we compare their account would seem to be variable, and may therefore be Kepler's star shorn of its brilliancy. About 6' following the calculated place of the Nova there is a 9th mag. star, followed by 2 fainter stars which form with it a rough isosceles triangle.

161. Period and light curve somewhat irregular.

162. There is an 11th mag. star np.

164. This star is sp the cluster 72 Ht VIII. The light increases from 10th mag. to max. in 51^d, and decreases again to the same point in the curve in 54^d. There is a 10th mag. star f, and a little n.

165. Schönfeld finds small change of light since 1870, and no signs of its being

periodical.

166. There is an $8\frac{1}{2}$ mag. star nf.

168. Schönfeld can determine no regular period.

169. The minima are bright and faint alternately, according to both Schmidt and Schönfeld.

170. The min, is always later than midway between 2 max. 171. This star has 2 maxima of 3.4 mag.; and 2 minima, one being 3.9 mag. and the other 4.5 mag.

174. Period uncertain. This star seems to have some connection with a nebula close by, which according to Schmidt may also be variable.

No.	Star.	R.A. 1899.	Decl. 1890.	Period.	Change Magnitu		overer.
175	T Coronæ Aust.	h. m. s. 18 54 34	-37 6.2	Days.	From t	to 3 Schmidt	1876
176	R Aquilæ	19 1 5	+ 8 3.9	345	61 11	1 1 Argeland	der 1856
177	T Sagittarii	19 9 53	-17 9.7	384	$7\frac{1}{2}$ 12	2< Pogson	1863
178	R Sagittarii	19 10 15	-19 30.0	270	7 13	3< Pogson	1858
179	S Sagittarii	19 13 0	-19 13.5	230	94 13	3½ Pogson	1860
180	T Sagittæ	19 16 47	+ 17 27.0		81/2	9½ Espin	1885
181	U Aquilæ	19 23 26	- 7 16.1	7.0	64 7	7 ¹ / ₄ Sawyer	1886
182	h¹(51)Sagittarii	19 29 21	-24 57.6		54 6	63 Gould	
183	R Cygni	19 33 52	+49 57.0	426	6 14	4< Pogson	1852
184	$\left\{ egin{array}{ll} Nova & ext{(II)} \\ ext{Vulpeculæ} \end{array} ight\}$	19 43 9	+ 27 3.0		3	Anthelm	15 11 11 11
185	S Vulpeculæ	19 43 54	+ 27 0.9	67.8	81/2 10	o Rogerson	n 1837
186	χ Cygni	19 46 20	+ 32 38.3	406	4 13	$3\frac{1}{2}$ G. Kirch	1686
187	η Aquilæ	19 46 52	+ 0 43.4	7.17	34 4	4 ³ Pigott	1784
188	S (10) Sagittæ	19 51 0	+16 20.6	8.38	51/2	6½ Gore	1885
189	Z Cygni	19 58 20	+49 44.2		7 14	4 Espin	1887
190	S Cygni	20 3 12	+57 40-1	323	83 13	31/2 Argeland	der 1860
	Z Cygni	19 58 20			7 14		

176. The light curve is very irregular, especially at the max., and during the first 2 months of the decrease. The changes from mag, 9 to mag, 7 previous to a max often take place with great rapidity. A red star. There is a $9\frac{1}{2}$ mag, star sp, and a $10\frac{1}{2}$ mag. star np.

177. A red star. 178. There is an $11\frac{1}{4}$ mag. star sp, and a $10\frac{3}{4}$ mag. star np.

183. A red star. According to Pogson the max. follows the min. by 155d. There

is a 10th mag. star n and a little f. The var. lies closely sf. θ Cygni.

184. This is Anthelm's temporary star of 1670, as to which see Chap. III. (ante). The place here given is that deduced by Schönfeld from the observations of Hevelius and Picard. Hind's place is -5° in R.A. and $-\frac{1}{2}$ in δ . A star suspected to be variable within a narrow range has been seen within 1' of arc of Schönfeld's place, but there is nothing to identify it with Anthelm's star. The next object, S Vulpeculæ, is certainly a distinct star.

185. The rise from min. to max. occupies less than one-half of the period.
186. This is Stone's designation, to distinguish the star from 17 Flamsteed Cygni which precedes and which Flamsteed by error termed x, misunderstanding Bayer's intentions, as it would seem. The period appears to be itself variable. The max. follows the min. by 185d. At some maxima the star is barely visible to the naked eye. A red star.

187. The period seems variable to the extent sometimes of 6h.

188. Owing to its proximity to a good comparison star, 11 Sagittæ, the variation, though small, is very evident. Duration of increase = 3^d; of decrease 5.3^{8d}.

189. A red star. Period as yet undetermined. Light curve probably interesting.

190. There is a 9th mag. star nf.

		_	-			_		
No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Cha Magn	nge of nitude.	Discoverer	
100	STATE OF STA	h. m. s.	0 ,	Days.	From	to		20/20
191	R Capricorni	20 5 8	-14 35.7	347	83	131/2	Hind	1848
192	S Aquilæ	20 6 33	+ 15 17.4	147	81/2	113	Baxendell	1863
193	Y Sagittarii	20 8 I	-22 18.8	364?	11?	14?	C.H.F.Peters	1872?
194	R Sagittæ	20 9 3	+ 16 23.7	71	81	101	Baxendell	1859
195	R Delphini	20 9 37	+ 8 45.4	284	71/2	13	Schönfeld	1859
1	MEDICAL PROPERTY.				183		Service PV	THE ST
196	R Cephei	20 7 36	+88 48.3	19 ±	5	II	Pogson	1856
197	P (34) Cygni	20 13 43	+ 37 41.4		3	?	Janson	1600
198	U Cygni	20 16 12	+47 32.9	461	7	$11\frac{1}{2}$	Knott	1871
199	S Capricorni	20 35 16	-19 23.2		9	11	Hind	1854
200	V Cygni	20 37 45	+ 47 44.9	448	63	$13\frac{1}{2}$	Birmingham	1881
1					1303			Mark to
201	S Delphini	20 38 0	+ 16 41.6	277	8	12	Baxendell	1860
202	X Cygni	20 39 6	+ 35 11.3	15.6	$6\frac{1}{2}$	$7\frac{3}{4}$	Chandler	1886
203	T Delphini	20 40 16	+ 15 59.9	332	8	131<	Baxendell	1863
204	U Delphini	20 40 25	+17 41.5	111 + ?	61	7 1 ?	Espin	1884
205	U Capricorni	20 42 3	-15 11.1	203	10	131/2	Pogson	1857
				1-351-19:20	1443	10 24 %		1000
206	T Cygni	20 42 48	+33 58.3	365?	5	6	Schmidt	1864
25 -5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		THE REAL PROPERTY.	Total Inc.			The same	3 - 4

191. The period is sometimes irregular to the extent of as much as 30d.

192. Light curve variable. Period has undergone remarkable changes. There is a 9th mag. star sf.

193. Is called W Capricorni by Chandler.

194. This star has two maxima and two minima in each period. The two minima have been reversed.

195. No min. seems to have been observed. There is a 12th mag. star sp. 196. The annual Precession in R.A. of this star is about -42 seconds of time.

This star is 24 Cephei of Hevelius.

197. This is the Nova of 1600, as to which see Chap. III. (ante). It has undergone numerous unquestionable changes of magnitude, but no attempts to assign a period have been successful.

198. A very red star, with variation, probably cyclical, in min. mag. There is an 8th mag. blue star nf, which Birmingham believed to be slightly variable.

200. Forms with 3 other stars the S. end of an irregular cross. A deep red star. A secondary max, follows the principal one 2m or 3m. Remains at min. mag. about 4m. 201. A red star. Period and fluctuations of light irregular. There is an 8th mag.

202. Bright and faint minima, but not regularly alternating. The increase occupies

41; the decrease 10d, with a pause about the middle of the latter.

203. The light increases from 10th mag. to max. generally in 28d, and decreases again to the same point in the curve in 49d. A yellowish-red star. There is an 11th mag. star np, and a 10th mag. star nf.

206. Period about 19, but in some years the variation is scarcely noticeable.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.
		h. m. s.	0,	Days.	From to	
207	T Aquarii	20 44 8	- 5 33.2	203	63 13	Goldschmidt 1861
208	T Vulpeculæ	20 46 49	+ 27 50.0	4 ^d 10 ^h	$5\frac{1}{2}$ $6\frac{1}{2}$	Sawyer 1885
209	Y Cygni	20 47 39	+ 34 14.7	1d 12h	7 8	Chandler 1886
210	R Vulpeculæ	20 59 30	+ 23 23.2	137 ±	$7\frac{1}{2}$ $13\frac{1}{2}$	Argelander 1858
211	W Capricorni	2I I I2	-24 21.7	310 ?	9 14?	C.H.F.Peters 1867
212	X Capricorni	21 2 15	-21 47.5	210?	1112? 14<	C.H.F.Peters 1872
213	T Cephei	21 8 5	+68 2.6	383?	51/2 10	Ceraski 1878
214	T Capricorni	21 15 57	-15 37.5	269	9 14<	Hind 1854
215	W Cygni	21 31 53	+44 53.1	126?	5 3 7 4	Gore 1885
216	S Cephei	21 36 36	+ 78 7.7	485	7 11 1 2	Hencke 1858
217	Nova Cygni		+42 20.4		3 131	Schmidt 1876
218		0, 0				Sir W. Herschel
1000		21 40 8	+58 16.5	irreg.	04	1782
219	U Aquarii	21 57 20	-17 9.4	200-300	10? 14?	Peters 1881
220	T Pegasi	22 3 31	+ 12 0.0	373	81 13<	Hind 1863
221	R. Piscis Aust.	22 11 45	-20 O.I		=12 11/2	Gould 1884
				MARKET STREET		
					1	
		22 38 22	+41 47.6	315		
225	S Aquarii	22 51 13	-20 55.8	279	74 122<	Argelander 1853
220 221 222 223 224 225	R Piscis Aust. 8 Cephei R Indi R Lacertæ	22 II 45 22 25 5 22 28 10 22 38 22	-30 9·1 +57 51·1 -67 51·3 +41 47·6	5·37 315	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Gould 188 Goodricke 178 Gould 188 Deichmüller 188

207. Though Goldschmidt in 1861 from his own observations announced this as a variable, it is so marked in the XXth Berlin Star Chart (by Hencke) published previously.

208. The increase occupies 1d; the decrease 31d. 210. There is a $9\frac{1}{2}$ mag. star nf.

211. Chandler calls this V Capricorni.

213. A red star.

214. There is a 9th mag. star np.

216. An intensely red star. Winnecke finds that the max. follows the min. by

217. This is Schmidt's Nova discovered on Nov. 24, 1876 shining as a 3rd mag. star. For further particulars see Chap. III. (ante). It has now disappeared.

218. This is Sir W. Herschel's well-known "Garnet star." Period very uncertain; at any rate much less than "5 or 6 years" as sometimes stated: perhaps 14 months is not far from the truth.

220. This star seems to remain a long time at the IIth mag., especially when approaching a max.

222. The period otherwise expressed is 5d 8h 48m. The interval from max. to min. is 3d 19h, but from min. to max. only 1d 14h. The fluctuation of light seems to receive a check from 16h to 24h after max.

No.	Star.	R.A. 1890.	Decl. 1890.	Period.	Change of Magnitude.	Discoverer.
226 227 228 229 230 231 232 233 234	β Pegasi R Pegasi S Pegasi R Aquarii 19 Piscium R Phœnicis R Cassiopeiæ U Cassiopeiæ	23 14 59 23 38 8 23 40 46 23 50 45 23 52 16 23 52 49	0 / + 27 29·0 + 9 57·0 + 8 19·1 - 15 53·8 + 2 52·6 - 50 24·1 - 9 34·4 + 50 46·4 + 59 44·5	Days. 40 ±, irreg. 382 318 388 165 ± 273? 429	From to $2 2\frac{3}{4}$ 7 $13\frac{1}{2}$ < 7 $13 < 5\frac{3}{4}$ 11? $4\frac{3}{4}$ $6\frac{1}{4}$ 8\frac{1}{2} 11 < 9\frac{3}{4} 14\frac{9}{4} 13 < 6 9	Schmidt 1847 Hind 1848 Marth 1864? Harding 1811 Espin 1884 Gould 1885 C.H.F.Peters 1879 Pogson 1853 Birmingham 1877
104a	— Hydræ	13 42 49	-27 49-2	±1 year	7 8	Sawyer 1889

226. The period is indeterminate; Schmidt said sometimes 36^d ; sometimes 43^d . Argelander suggested 41^d , but Schönfeld considers it altogether irregular between the limits of 30^d and 50^d .

227. It does not seem possible to reconcile the recent with the earlier observations

as regards the period.

229. Some uncertainty in the period may perhaps be explained by the supposition that the star has a secondary as well as a primary max. A red star.

230. A deep orange star.

232. Chandler calls this V Ceti.

233. At times a very red star. Schönfeld considers that the period is certainly diminishing. There is an 11th mag. star closely np. 104 a. Colour "quite red."

PART II.—STARS PROBABLY VARIABLE.

No attempt has been made to render this list exhaustive, for the simple reason that there are hundreds of stars believed with more or less probability to be subject to fluctuations of light.

The last edition of this work contained but 35 stars ranked as suspected variables. I have however increased that number considerably in the present edition by the aid of the valuable catalogues compiled by Mr. J. E. Gore ^a. But as Mr. Gore's first list comprises 773 objects, it is evident that I have passed over a very great many. In making the present selection I have been guided in the main by the following considerations:—

- (1) That the star should be one usually visible to the naked eye.
- (2) That the suspicion of variability should depend on the observations of at least 2 observers of known experience.

Besides the 2 foregoing conditions, a slight preference has been shown to stars which are (a) situate in the Northern hemisphere, or (b) which are red or orange in colour.

From these explanations the reader will have no great difficulty in understanding that the list as here framed is intended to suggest to amateur astronomers a branch of research in which they can render useful service to science, and the fact that such a large proportion of the stars here given belong to the Southern hemisphere is significant of the amount of work remaining to be done there. For practical hints on the conduct of variable star observations, see vol. ii. p. 283 (ante).

The magnitudes given in the 5th column, and the resulting range, are only to be deemed approximate.

^a These are referred to at p. 271 ante. And some particulars of about 350 stars contained in the *Harrard Photometry* which may be regarded, on evidence

more or less conclusive, to be variable stars, will be found in *Annals of Harvard* College Observatory, vol. xiv. Part II. p. 431.

No.	Star.	R.A. 1890.	Decl. 1890.	Probable	Authority - Domoska
No.	star.	N.A. 1890.	Deci. 1890.	changes of Magnitude.	Authority: Remarks.
	D	h. m. s.	0 /		
I	γ Pegasi	0 7 34	+ 14 34.3	2 <u>1</u> 3	Schwab. Period 27½d?
2	- Ceti	0 18 12	-10 14.2	$\begin{cases} 7 & \text{10} \\ \left\{ \text{through } \frac{1}{2} \text{ a} \right\} \end{cases}$	Borrelly.
3	Arg. + 81°18Ceph.	0 40 58	+81 22.0	mag.	Pickering; Knott.
4	2598 Lal. Ceti	1 20 16	- 4 31.9	$6\frac{1}{2}$ $7\frac{1}{2}$	Gould.
5	112 Piscium	1 54 26	+ 2 34.3	$6 6\frac{1}{2}$	Schmidt.
6	61 Ceti	1 58 10	- 0 52.1	6 7	Sir W. Herschel.
7	ν Fornacis	I 59 33	-29 49.5	5 6	Gould.
8	[937 Lac. Horo-]	2 49 56	-63 21.5	6 63	Gould. "Strikingly red."
9	z Eridani	3 26 18	-41 44.4	4 6½	Houzeau, 1875.
10	7172 Lal. Tauri	3 47 17	+ 7 26.9	63 8	Gould.
11	γ Eridani	3 52 53	-13 49.3	$2\frac{1}{2}$ $3\frac{1}{2}$	Secchi.
12	48 Tauri	4 9 30	+ 15 7.7	6 7	Schmidt.
13	U Tauri	4 15 24	+19 33.3	9 101	Baxendell. A double, 3".
14	54 Eridani	4 35 38	-19 53.0	41/2 5	Gould.
15	π¹ Orionis	4 43 51	+ 6 46.1	3½ 5	Gould. Period 54½ (Gage).
16	5 Orionis	4 47 38	+ 2 19.5	$5\frac{1}{2}$ $6\frac{1}{2}$	Gould. Red star.
17	R Eridani	4 50 21	-16 35.6	5.4 6	Gould.
18	S (64) Eridani	4 54 49	-12 42.0	4.8 5.7	Gould.
19	16 Birm. Add. Leporis	5 6 38	-I2 I·2	$5\frac{1}{2}$ $7\frac{1}{2}$	Burton. Very red star.
20	31 Orionis	5 23 59	- I IO.8	44 6	Gould. Very red.
21	- Tauri	5 28 16	+ 21 52.1	81/2 111/2	Schmidt.
22	T (bis) Orionis	5 29 8	+ 10 10-2	5.7 6.7	Thome (Gould).
23	10527Lal.Orionis	5 29 38	- 6 5.0	$5\frac{1}{2}$ $7\frac{1}{2}$	Falb and Gould. sp & Orionis.
24	2145 Lac. Pictoris	6 1 55	-48 26.9	6 7	Tebbutt. A close double, 21".
25	11884Lal.Orionis	6 8 54	+13 53.0	$6 \qquad 6\frac{1}{2}$	Gould.
26	12104Lal.Orionis	6 14 27	- 2 53.9	5½ 6	Gould.
27	2470 Lac. Canis Majoris	6 45 42	-27 12.4	6 8	Gould.
28	σ Canis Majoris	6 57 20	-27 46.6	5 4½	Gould. Very red star.
29	27 Canis Majoris	7 9 46	-26 9.8	5 6	Gore.
30	2761 Lac. Puppis	7 16 18	-47 I·o	6? 8 <u>1</u>	Gould; Stone.
31	{W. B. (2) VII.} 669 Monoc.}	7 23 45	- I 40·7	$4\frac{1}{2}$ 9	Olbers, 1824.

				Probable	
No.	Star.	R.A. 1890.	Decl. 1890.	changes of Magnitude.	Authority: Remarks.
	[14970Lal.Canis]	h. m. s.	0 ,		
32	Minoris	7 35 48	+ 3 52.9	6 7	Gould. Period several years?
33	R Puppis	7 36 36	-31 24.3	$6\frac{1}{2} \qquad 7\frac{1}{2}$	Gould.
34	T Puppis	7 44 23	-40 22.6	61/2 71/4	Gould.
35	22P.VIII.Puppis	8 7 42	-4 ² 39·5	$5 5\frac{3}{4}$	Gould.
36	β Volantis	8 24 32	-65 46.2	4 5	Gould.
37	3344 Lac. Argûs	8 24 50	- 26 57.9	6 8	Gould.
38	R Pyxidis Nau-	8 48 20	-36 7.8	$6\frac{1}{2}$ $7\frac{1}{2}$	Gould.
39	Arg. + 11°:1954	8 52 17	+ 11 15.5	7.7 8.6	Baxendell.
40	Cancri SurvidisNauticæ	9 3 13	-25 24.7	4 5	Gould. Orange star.
		, , ,			
41	26P. IX. Velorum	9 9 6	-38 9.7	6 7	Gould.
42	N Velorum	9 27 53	-56 32.9	$3\frac{1}{2}$ $4\frac{1}{2}$	Gould. Period 4½ Colour var.?
43	R Velorum	10 2 0	-51 39-1	$6\frac{1}{2}$ $7\frac{1}{2}$	Thome.
44	q Carinæ	10 13 24	-60 47.0	4 5	Gould. Red star.
45	r Velorum	10 17 36	-41 5.8	5 6	Gould. Red star.
46	I Carinæ	10 22 12	−73 28·3	4 5	Gould.
47	t¹ Carinæ	10 32 13	-58 59.5	$5\frac{1}{2}$ $6\frac{1}{2}$	Gould.
48	4422 Lac. Carinæ	The same of the sa	-59 6.1	5 7	Thome.
49	256 P. X. Crateris	0 0	-27 29.0	5 6	Gilliss. Short period?
50	η Crateris	11 50 24	-16 32.3	$4\frac{1}{2}$ $6\frac{1}{2}$	Houzeau, 1875.
51	b (7) Virginis	11 54 18	+ 4 16.1	4 6	Flammarion?
52	5013 Lac. Hydræ		-35 4.9	6 61	Gould.
53	€ Corvi	12 0 27	-35 4·9 -22 0·5	3 4	Gould.
54	δ Ursæ Majoris	12 9 58	+ 57 36.8	$\begin{bmatrix} 5 & 4 \\ 2\frac{1}{2} & 4 \end{bmatrix}$	Pigott.
55	γ Corvi	12 10 9	-16 55.9	$2^{\frac{1}{2}}$ 3	Gould.
55		12.0 9	20 55.9	-2 3	
56	η Virginis	12 14 16	- 0 3.3	3 4	Gould.
57	277Birm.Virginis	12 19 37	+ I 22.8	$6\frac{1}{2}$ $8\frac{1}{2}$	Birmingham and Espin.
58	8 Corvi	12 24 11	-15 54.2	$2\frac{3}{4}$ $3\frac{1}{2}$	Gould.
59	23793 Lal. Can. Venaticorum	12 39 57	+46 2.5	41/2 6	Schmidt and Espin. Orange star.
60	63 Virginis	13 17 8	-17 9.5	5 6	Gould.
61	82 Urem Majoria	12 26 22	455 74		Birmingham. Orange star.
62	83 Ursæ Majoris		+ 55 14.4	4 5	Gould.
02	g (2) Centauri	13 43 4	-33 54.0	4 2 5	Gould.

Chap. XI.] A Catalogue of suspected Variable Stars. 289

000			NAME OF THE PARTY	45.35	-00	TO THE PROPERTY OF STREET
No.	Star.	R.A. 1890.	Decl. 1890.	Probachang Chang Magni	es of	Authority: Remarks.
63	η Ursæ Majoris	h. m. s.	° , +49 51.7	2	0	Espin, &c.
64	v Boötis	13.44 11	+ 16 20.6	4	4 I	Schmidt. Reddish star.
65	θ Apodis	13 54 38	-76 15.9	$5\frac{1}{2}$	$6\frac{1}{2}$	Gould. Red star.
	a la	15 54 50	-70 15.9		. 2	CAOUTE STORY
66	26325 Lal. Boötis	14 18 53	+ 8 35.2	6	$7\frac{1}{2}$	Birmingham.
67	6077 Lac. Apodis	14 45 22	-76 I2·8	$5\frac{1}{2}$	6	Gould. Red star. [Sir J. Herschel; Espin.
68	βUrsæ Minoris	14 51 2	+74 36.3	21	23/4	$\begin{cases} \text{Sir J. Herschel; Espin.} \\ \text{Period 10}_{2}^{1d} ? \end{cases}$
69	T Triang. Aust.	14 59 30	-68 17.7	7	$7\frac{1}{2}$	Gould. Period 1d.
70	6320 Lac. Lupi	15 14 5	-44 32.4	63	$7\frac{1}{2}$	Taylor; Gould.
71	6439 Lupi	15 29 17	-32 43.5	61/2	7	Gould.
72	τ [‡] Serpentis	15 31 22	+ 15 28.0	6	8	Birmingham. Red star.
73	28607 Lal. Libræ	15 37 11	-10 34.2	7	83	Weiss, 1879.
74	6514 Lac. Lupi	15 39 42	-34 20.2	$5\frac{1}{2}$	$6\frac{1}{2}$	Gould.
75	16578 Lac. Tri-	15 51 18	-63 27.7	$6\frac{3}{4}$	$7\frac{1}{2}$	Gould.
	anguli Aust.	-0 0			. 2	
76	379 Eirm. Ophi-	16 20 37	-12 IO·I	71/2	9	Birmingham. Red star.
77	XSc orpii	16 22 49	-19 15.2			C. H. F. Peters, 1880.
78	Scorpii	16 29 7	-35 I·7	41	5	Gould.
79	391 Birm. Ophi-	16 45 33	- 5 59.3	9	0	Birmingham.
80	vchi 5	16 51 55	-56 23.2	61	71	Gould.
18	30 Ophiuchi	16 55 15	- 4 3.5	5	6	Gould. Orange star.
82	μ Draconis	17 3 3	+ 54 37.1	4	5	S. J. Johnson.
83	ι Apodis	17 9 50	-70 0.3	5	6	Gould. (H. T. Vivian, 1870. Period
84	e (69) Herculis [418 Birm. Ser-]	17 13 51	+ 37 24.3	5	6	21d?
85	{ pentis }	17 38 28	-18 36.4	71/2	0	Birmingham.
86	z (88) Herculis	17 47 12	+48 25.4	5 ½	7	Peirce.
87	[]420 Birm.Ophi-	17 48 38	+ 1 47.3	$7\frac{1}{2}$	0	Birmingham.
88	\ uchi \ \ γ Sagittarii	17 58 44	-30 25.3	3	3 <u>I</u>	Gould. Period long?
89	57681 Lac. Sagit-	18 14 45	-24 57.8	6	7	Gould.
90	tarii 5	18 43 8	-20 27.0	5	6	Gould.
300	· · · · · · · · · · · · · · · · · · ·	SALE OF			0	Schmidt: Espin. Red star.
91	35611Lal.Aquilæ 8122 Yarnall		- 5 50.8	7	8	
92	Sagitt.	19 0 42	-18 54.4	6	7	Gould.
93	β Cygni	19 26 17	+ 27 43.7	3	4	Klein. Years?
94	μ Aquilæ	19 28 42	+ 7 8.8	4	5	Gould. Double: dist. 2.8". B also
95	€ Draconis	19 48 32	+69 59.2	3 3 4	434	var.

	,			NEW YORK	-	
No.	Star.	R.A. 1890.	Decl. 1890.	chan	pable ges of itude.	Authority: Remarks.
		h. m. s.	0 ,			
96	535 B	20 6 7	+47 31.4	7 1/2	$9\frac{1}{2}$	Espin, 1886? Red star.
97	Arg. + 35°,4002 Cygni	20 6 14	+ 35 37.0	81/2	10	Espin, 1886. Red star.
98	541 B. Cygni	20 9 23	+ 38 23.5	61/2	8	Espin, 1887. Red star.
99	38839 Lal. Capric.	20 10 40	-21 39:3	61/2	$8\frac{1}{2}$	Secchi. "Ruby" star.
100	558 Birm. Delph.	20 20 27	+ 9 42.0	6	0	Birmingham. Orange star.
101	[Arg. + 39°,4208]	20 24 50	+ 39 36.7	8	0	Espin, 1885. Red star.
102	Cygni S	20 28 21		41/2	9 5 ¹ / ₄	Gould.
103	D .		-6154.4 -678.9		6	Gould.
104	DD C	20 31 51		5 8?	$0^{\frac{1}{2}}$?	Espin, 1888.
104	D 1 1: :		+44 28.1	6	$6\frac{1}{2}$	Schmidt. Period short.
105	13 Delpnini	20 42 21	+ 5 36.2	0	02	Schmat. Teriod short.
106	14 Delphini	20 44 25	+ 7 27.2	51/2	7	Schmidt.
107	63 Cygni	21 2 47	+47 12.3	41/2	6	Espin, 1882.
108	8721 Lac. Pavonis	21 8 53	-65 8.3	$5\frac{1}{2}$	6	Gould.
109	8768 Lac. Indi	21 13 44	-50 23.9	6	74	Gould.
IIO	γ Indi	21 18 23	-55 8-1	6	$6\frac{1}{2}$	Gould.
						[Period 383d? Double star,
III	β Cephei	21 27 14	+70 4.6	3	31/2	dist. 13".
112	€ Pegasi	21 38 47	+ 9 22.2	2	2 ½	Schwab. Period 25 ^{3d} ?
113	596Birm.Aquarii	21 40 50	- 2 43.4	6	72	Birmingham. Period, years?
114	U Aquarii 19036 Lac. Pis.]	21 57 18	-17 IC-O	10 ?	14?	Peters, 1881.
115	Aust.	22 3 30	-34 33.3	53	7	Gould. Reddish star.
116	39 Aquarii	22 6 29	-14 44.1	6	61	Gould.
117	ζ Piscis Aust	22 24 47	-26 38.1	5	$6\frac{1}{2}$	Schmidt, Period long.
118	η Pegasi	22 37 50	+29 38.7	3	31	Christie.
119	ι Cephei	22 45 45	+65 37.4	334	04	Schmidt. Period 369d?
120	7995 B. A. C. Lacertæ	22 51 39	+49 9.1	$4\frac{1}{2}$	5 ½	Pierce.
100	A Section of	153000				
121	303 B Aquarii \$\int 22743 \text{ \text{\text{\text{0}}}. Arg.} \right\}	23 11 55	-12 18.8	6	7	Schmidt.
122	Aquar.	23 12 41	-19 26.6	7	8	Schulhof.
123	8 Andromedæ	23. 12 37	+48 24.8	$5\frac{1}{2}$	6	Gore, 1876. Red star.
124	ψ ³ Aquarii	23 13 14	-10 12.7	4	5	Schönfeld. Period long?
125	Andromedæ	23 32 44	+ 42 39.5	$4\frac{1}{2}$	5 ?	Gore.
126	3 Ceti	23 58 52	-11 7.3	5	6	Gould.
671		-3 30 52	1.3	D		
		o pi		200	1 150	

CHAPTER XII.

A CATALOGUE OF "RED" STARSa.

THE following Catalogue is the outcome of many hundreds of observations, extending over (more particularly) a period of about 20 years (1870-89). Between 1870 and 1881 the telescope employed was a 4-inch Refractor by Cooke, but the observations made since 1884 were made with a 6-inch Refractor by Grubb, almost always charged with an eye-piece of very low power, having a field of 1½.

The existing Catalogues of red stars from which contributions have been levied are the following: but I have not limited myself to these, having considered the claims of all stars termed "red" wheresoever mentioned:—

1804. LALANDE, J. DE, Tables des Étoiles Rouges. (Connaissances des Temps, An. xv. p. 378.)

1822. DE ZACH, Baron, Étoiles Rouges. (Corresp. Ast., vol. vii. p. 298.)

1847. Herschel, Sir J., Ruby-coloured, or very Intense Red Stars. (Cape Observations, p. 448.)

1866. Schjellerup, H. C., Catalog der rothen, isolirten Sterne.

(Ast. Nach., vol. lxvii. No. 1591, June 18, 1866; Addenda, vol. lxviii. No. 1613, October 30, 1866.

1872. SCHMIDT, J. F. J., Verzeichniss rothgelber Sterne.
(Ast. Nach., vol. lxxx. No. 1902, September 5, 1872.)

1874. Schjellerup, H. C., Zweiter Catalog der rothen, isolirten Sterne.
(Vierteljahrsschrift der Astronomischen Gesellschaft, vol. ix.)

1876. Burnham, S. W., Catalogue of Red Double Stars.
(Month. Not., vol. xxxvi. p. 331, 1876.)

1877. BIRMINGHAM, J., Observations and Catalogue of Red Stars. (Trans. Roy, Irish Acad., vol. xxvi. p. 249, 1877.)

1877. FEARNLEY, Des Etoiles colorées.

(Ast. Nach., vol. lxxxix. No. 2121, March 27, 1877.)

^a Revised and condensed from a catalogue published in *Month. Not.*, vol. xlvii. p. 348, April 1887.

1879. LINDEMANN, E., Verzeichniss von 42 neuen rothen Sternen.
(Bulletin de l'Acad. de St.-Pétersbourg, vol. xxv. p. 155.)

1882. DREYER, J. L. E., Mean places of 321 Red Stars.
(Dunsink Observations, Part IV. p. 35.)

1882. LINDEMANN, E., Zweites Verzeichniss neuer rother Sternen.
(Bulletin de l'Acad. de St.-Pétersbourg, vol. xxviii. p. 278.)

1885. Espin, Rev. T. E., Some New Red Stars.

(Journal of Liverpool Ast. Soc., vol. iii. p. 82, March 1885.)

1886. Espin, Rev. T. E., Some New Red and Orange-red Sturs.
(Month. Not. R.A.S., vol. xlvi. p. 293, March 1886.)

This Catalogue makes no pretension to being exhaustive; it must not be regarded as more than it professes to be, namely, a working list of the best of the red stars, almost always excluding known variables, many of which are notoriously red in colour. My reason for excluding known variables was this: their inclusion would have been a trap to observers using this list for the purpose for which alone it is designed, namely, to facilitate the study of any red stars which are always within reach of their instruments (regard being had to the season of the year and the latitude of the place of observation).

And in another sense this Catalogue is not exhaustive; it only includes stars of decided colour and not less than 81 magnitude. It may be that my eyes are not so sensitive to red hues as many other eyes are, but I certainly have often considered that many of my predecessors in the observation of red stars have greatly exaggerated the colours they have ascribed to particular objects. Taking the so-called "red" stars all round, my opinion is that a more generally accurate generic term for them would be "orange" stars, and that very few indeed rise to real "red," and that less than a dozen can be truly termed "carmine" or "ruby." These remarks seem requisite by way of caution in order to guard inexperienced observer from being disappointed when they come to examine for themselves stars described by Sir W. Herschel, Sir J. Herschel, Schmidt, and others, as "red" or "very red." There can be no doubt that these observers saw many stars to possess a redder tinge than they have since been found to exhibit. This may have been in the case of the Herschels some effect of their metallic mirrors, or of their evesight, or may have been due to both causes combined; and, speaking generally, it may be said that the vast majority of the stars here catalogued are "orange" more than anything else. I would for this purpose define as "orange" the colour exhibited by the gilding inside articles of silver plate newly gilt.

A few, and only a few, explanations are requisite as to the principles on which the Catalogue has been constructed. In column 1, one asterisk indicates objects of particular interest; 2 or 3 asterisks, objects of special and remarkable interest. Column 2 gives the progressive numbers, if any, from Birmingham's catalogue. The places in columns 4 and 5 have been taken from the best authorities available, brought up to 1890. I have freely consulted the Catalogues of Stone and Yarnall, and the Armagh Catalogue, and the two Radcliffe Catalogues, besides Birmingham's and the Dunsink Catalogue of 1882. The places of such of the stars as are to be found in the Nautical Almanac for 1890, or the American Ephemeris for 1889, are taken from those works respectively. Espin's places are as given by him, but brought up from 1885 to 1890. As, however, he only quotes the Durchmusterung to the nearest minute of Right Ascension and Declination, my 1890 places of his stars will be less exact than in the case of all the other stars. The magnitudes in column 6 are in all cases from Pickering's Harvard Photometry, where the star was to be found in that important and interesting record; one of the most valuable contributions to practical astronomy that has appeared for many years. The magnitudes of many of the remaining stars have been determined by Mr. C. G. Brodie by Dawes's method. In the column headed "Colour; Remarks" the information given within inverted commas has been generally taken from published sources, although the authority is not in all cases mentioned. All other details not in inverted commas reproduce the results of my own original work. The stars originally examined by myself amounted to 589, out of a total of 719, being virtually nearly all those visible in England; and it is out of those 719 (with perhaps half a dozen added) that I have chosen the 500 stars which make up this working List.

It would not be difficult to offer many interesting and suggestive reflections as the result of a prolonged study of the red stars; but one would soon be apt to drift away into speculations, which, however attractive to some minds, would not only be mere speculations, but would relate to matters quite beyond the domain of astronomy proper. I will therefore here only record the well-known facts that many of the stars certainly variable are red, and that many of the red stars have, since they were first noted as such, been found to be variable. The instances that could be cited in support of these statements are very numerous, and it is quite impossible for the coincidence between the redness of the colour and the variability of the light of several hundred stars to be accidental. What it means I do not presume to suggest. Amongst observers who have paid much attention to the colours of stars a foremost place must be given to the late Mr. J. Birmingham, of Tuam, whose labours in the matter of red stars added much to our knowledge of stellar colours. It was he who remarked that "a space of the heavens, including the Milky Way, between Aquila, Lyra, and Cygnus, seems so peculiarly favoured by red and orange stars that it might not inaptly be called "the red region," or "the red region of Cygnus;" and, although the chances of finding a star of any stated colour must, of course, be greater among the countless multitudes of the Milky Way than elsewhere, still its other portions visible in this latitude show no such special richness in red stars.

One other remark of Birmingham's will be useful in this place: "The red stars seem as liable to change of tint as to change of magnitude; and, although modifications of colour may have been remarked without any striking change of size, still I have observed that as a red variable increases it grows paler, and that it reddens deeper towards the minimum. Schmidt has made the same observation, and it well accords with the fact that all the very red stars are telescopic, and none of them visible to the naked eye. This is noteworthy, and seems difficult of explanation; but the cause, as I would suggest, may be found in the quality of light received from the object. As we do not see the

stars by their discs, but by the amount of their light, according to apparent magnitude, it seems evident that the very red stars, shining with only a part of the components of white light, must appear less bright than the white stars, and seem therefore generally small. According to this view, it might be assumed that the few naked-eye reddish stars would appear larger if white; so that Aldebaran, Betelgeuse, &c., if of that colour, might be rivals of Sirius. The redness of a star has given rise to the singular conceit that it shows a cooling down, or, as we might say, an approach to a final snuffing out of the luminary; but one might think that the fact of periodic variation of tint in many of the red stars ought to go far in disproving this proposition."

The reason why stars below the 9th magnitude are not included is that, where one is dealing with a star which is near the minimum visibile of a telescope, estimations of colour are apt to become very imaginary in many cases. I say this without any desire to impute bad faith to an observer who might talk about "magnitude 13, colour red;" but the chromatic notions of such a person must be received with a certain amount of distrust. I do not believe that it is, as a rule, possible to assign colour to stars of the 12th or lesser magnitudes, except a very large telescope indeed happens to be employed in viewing them.

The question has often been discussed as to how far flat surface diagrams of colour are of any use as standards of comparison for coloured stars. On the whole it may be said that their usefulness is doubtful. I have often thought of trying whether a series of transparent discs of coloured glass, arranged in gradations of colour, and mounted in a frame sufficiently portable to be held in the hand by the observer whilst his eye is looking through the telescope, might not be used for comparisons of star colours. Probably the chief difficulty would be the obtaining of a sufficiently pure white light wherewith to illuminate the discs. If this were got over by the use of electricity or otherwise, such an apparatus might be effective and trustworthy, whilst it need not be very expensive nor very cumbersome.

		13110				1 6				
	Number.				-		- n	6333		Fine fiery red. Pale red. Reddish. Prange. Piery orange. Piery red. Pale red. Orange red. Orange red. Orange. Red. Prange. Fiery red. Reddish. Prange. Piery red. Reddish. Prange with a blue companion at 10" distance. Prange. Piery red when approaching max. Piery red; about mid-
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R. 189			ecl. 390.	Mag.	Colour; Remarks.
I	3		Ceti		m. 13	s. 49	- 9	26.0	31/2	Pale orange.
*2	4	3	— Andromedæ	0	14	5	+ 44	5.9	8	Fine fiery red.
3			— Cassiopeiæ	0	29	9	+67	19.2	63	Pale red.
4			— Cassiopeiæ	0	31	21	+67	2.2	74	Reddish.
**5	8		δ Andromedæ	0	33	26	+30	15.6	31/4	Orange.
6			— Cassiopeiæ	0	44	25	+61	10.8	61	Fiery orange.
7			— Cassiopeiæ		46	417	+69	21.9	7 1	Orange.
8	17		β Andromedæ	I	3	34	+ 35	2.2	21	Red.
***9	18	7	- Piscium	I	IO	4	+ 25	11.2	7	Fiery red.
10	23	Ioa	— Cassiopeiæ	1	20	3	1	30.4	7	Pale red.
11	24		R Sculptoris	I	21	55	-33	7.3	6	"Orange red" (J. Herschel). "Brilliant scarlet" (Gould).
12			36 Espin Persei	I	26	I	+ 57	49.7	6	Orange.
13	28		a Eridani	I	33	36	-57	47.7	1	" Red."
**14	29		ν Piscium	13	35		+ 4	55.8	5	Orange.
***15	31	14	— Cassiopeiæ		47			39.8	8	Fiery red.
16		WE T	— Ceti	I	54	59	+ 9	9.2	6	Reddish.
***17	34		γ Andromedæ		57	8		48.1	21/4	Orange with a blue com-
**18	35		a Arietis	2	0	58	+ 22	56.5	2	Orange.
19	37		60 Andromedæ	2		19	13.900	42.9	5	Orange.
20	40	19	o Ceti	2	13	Color.	100	28.7	Var.	Fiery red when approaching max.
21	41	20	— Persei	2	14	15	+ 56	38.2	9	Fiery red; about mid- way between the clusters 33 and 34 H VI. In a grand field,
22	***		65 Andromedæ	2	18	17	+49	46.7	5	Good orange.
23	45	(v	Arg. + 65°: 280 Cassiopeiæ	2	28	37	+ 65		6	Deep orange.
24			15 Trianguli	2	29	6	+ 34	12.5	Var	Reddish orange. Blue star near.
25	46	22	— Andromedæ	2	30	26	+ 56	35.6	5-8 8	Pale red.
25	47	23	855 Weisse Tri- anguli	2	37	24	+ 31	54.2	$7\frac{1}{2}$	Red; neb. h 257 p (D'Arrest). "Pale orange" (Dunsink).
27	49		η Persei	2	42	40	+ 55	26.3	4	Orange.
28	51		— Cassiopeiæ	2	47	19	+63	53.0	61/2	Deep orange.
W	0-		- Carrio Posto		71	-9	, 03	000	2	T. V. W. Sv.

Number.							
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R. A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
*29	52	·	a Ceti	h. m. s. 2 56 31	+ 3 39.5	23/4	Decided orange. "Orange red" (Robinson).
30	57		— Persei	3 4 49	+47 18.6	7	Pale red; 2 small red stars in the field sf.
31	59	•••	1014 B. A. C. Horologii	3 9 46	-57 44.0	7	"Red."
32	58	T	6048Lal, Eridani	3 10 11	- 9 10.6	7	Reddish; p & Erid. 185, and 4' to the N.
33	60	26	W. B. III. 152 Eridani	3 10 55	- 6 7.9	7	Reddish orange.
34			o Tauri	3 18 53	+ 8 38.5	31/2	Orange. "Red" (Uran. Arg.).
35	. 61		Arg. + 54°: 685 Camelopardi	3 21 49	+ 54 59.5	71/2	Pale Red.
36	62		σ Persei	3 22 49	+ 47 36.9	41/2	Pale orange; contrasts well with white stars near.
37			Arg. + 79°: 110 Camelopardi	3 32 20	+79 58.4	73/4	Red.
*38	65	27 a	— Camelopardi	3 32 21	+62 17.4	7	Pale crimson. "? Var."
39	68	30	6921Lal.Eridani	3 38 28	- 9 57.3	8	Reddish. Evidently Var. 7-8 (G.F.C.).
40	. 69		121 P. III. Ca- melopardi	3 39 17	+65 10.9	6	Deep Orange. Mag. 4.75 (Uran. Oxon.).
41	70	30a	π Eridani	3 40 56	-12 26.8	5	Reddish orange.
42			Arg. +24°: 570 Tauri	3 41 29	+ 24 38.9	7	Reddish orange.
43	71	31	1204 B. A. C. Ca- melopardi	3 47 43	+60 47.1	6	Pale orange.
44			γ Hydræ	3 48 57	-74 34.5	31/2	"Deep yellow" (Williams).
45	72	32	7272 Lal. Eridani	3 49 53	-15 13.8	7	Reddish orange; a larger star of the same colour p a little s.
46		940. 2	γ¹ Eridani	3 52 53	-13 49.3	3	Reddish orange. "Reddish" (Robinson).
47			Arg. +61°: 667 Camelopardi	3 56 20	+61 29.6	$7\frac{1}{2}$	Decided Red.
48			γ Reticuli	3 59 17	-62 28.0	5	"Deep yellow" (Williams).
49			Arg. + 32°: 743 Persei	4 5 59	+ 32 14.8	7	Fiery orange.
50	74	34	Tauri B. A. C.	4 15 54	+ 20 33.6	$6\frac{1}{2}$	Fiery orange.
51			Arg. + 34°: 874 Persei	4 17 4	+ 34 59.4	7	Red.
52			45 Eridani	4 26 15	- 0 170	5	Deep orange. "Red" (Uran. Arg.).

Number.					D 4	N				Colour; Remarks.
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R.A.		De 18	90.	Mag.	Colour; Remarks.
53	79	38	8623 Lal. Eridani		m. 28		- I I	, 1·1	61/2	Reddish.
*54			47 Eridani	4	28	53	- 8	27.5	5 1/2	Reddish orange.
55			W.B. IV. 585 Eridani	4	29	8	- 9	10.3	6	Fiery red. "Red" (Uran. Arg.).
**56	81		a Tauri	4	29	36	+ 16	17.2	1	Deep reddish orange.
57	82	40	— Aurigæ		38	7	+ 32	42.8	834	Pale crimson; a larger orange star p.
*58	83	41	1457 B.A.C. Ca- melopardi.	4	39	48	+67	58.4	7	Fiery red.
*59	85	43	— Aurigæ	4	44	37	+ 28	20.2	8	Unmistakably crimson.
60	87	44	o¹ Orionis	4	46	19	+14	4.2	51/2	Reddish orange.
*61	88	45	5 Orionis	4	47	38	+ 2	19.5	5 3 4	Deep orange. "Probably var."
62	89	46	236 P. IV. Orionis	4	48	51	+ 7	36.0	6	Deep golden yellow. "Orange red" (Brodie).
63	91		6 Aurigæ	4	52	49	+ 39	29.3	$6\frac{1}{2}$	Red.
64		•••	3 Espin Aurigæ	4	53	3	+40	4.6	7 1/2	Fiery red.
**65	94	49	R Leporis	4	54	36	-14	58.2	Var.	Decided crimson.
66	93	48a	ζ Aurigæ	4	54	47	+ 40	54.8	4	Fine deep orange. "Slightly orange" (Uran. Oxon.).
67	95	50	276 P. IV. Orionis	4	56	11	+ 0	33.7	6	Pale orange. "? Var."
68	96	51	899 H.P. Orionis	4	59	43	+ 1	1.5	7	Intense fiery red.
69	97		ε Leporis	5	0	48	22	31.1	31/4	Reddish orange.
*70			— Leporis	5	6	38	— I 2	1.2	71/2	Deep red.
71	102		Arg 0°: 890 Orionis	5	9	1	- 0	41.2	7	Pale orange.
72			5 Espin Aurigæ	5	10	59	+ 40	20.6	7	Reddish orange.
*73			Arg. + 40°: 1245 Aurigæ	5	11	12	+ 40	58.7	71/2	Red.
74			50 Espin Aurigæ	5	11	49	+ 35	40.3	81/2	Fiery red.
75			W.B. V. 266. Aurigæ	5	12	51	+41	0.3	51/4	Orange. "Slightly red" (Uran. Oxon.).
*76			53 Espin Orionis	5	10	50	-10	26.0	6	Reddish orange.
*77			52 Espin Orionis	-	20	7	+ 29		8	Almost pale ruby.
				1		-		170		

	Number.			1						
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R.A.			ecl. 90.	Mag.	Colour; Remarks.
78			— Aurigæ	1	m, 20	s. 38	+ 35	13.3	7	Good orange. In cl. 39
79			6 Espin Aurigæ	5	22	39	+40	25.5	71/2	Orange.
80	109	57b	S Orionis	5	23	34	- 4	47.0	Var.	Reddish. In centre of small equilat, triangle of 3 stars.
81	110	58	31 Orionis	5	24	8	- I	10.8	5-6	Deep orange. "Var."
*82	111	59	119 Tauri	5	25	47	+ 18	30.7	4 <u>1</u>	Pale red. "Good orange" (Brodie).
83	•••		7 Espin Aurigæ	5	26	31	+41	2.3	7 1/2	Reddish.
84		•••	54 Espin Aurigæ	5	26	31	+ 32	40.0	7	Reddish orange; blue star 6½ mag. near.
*85			156EspinOrionis	5	27	16	+ 7	3.6	73	Very red.
86			10483 Lal. Ori- onis	5	28	29	– I	32.4	7	Fiery red.
87	113		φ ² Orionis	5	30	51	+ 9	14.1	41/2	Orange.
88	114	60	- Orionis	5	30	58	+10	58.0	$6\frac{1}{2}$	Reddish orange.
*89			124 Tauri	5	32	34	+ 23	15.5	$7\frac{1}{2}$	Quadruple star; A red.
90			β Doradûs	5	33	26	-62	33.7	31/2	"Reddish yellow" (Williams).
91			157 Espin Aurigæ	5	33	37	+31	51.4	61/2	Fiery red.
*92			Arg. + 31°: 1058 Aurigæ	5	34	59	+31	49.1	81/2	Fiery red.
93	119		51 (b) Orionis	5	36	48	+ 1	25.3	5 ¹ / ₄	Orange. "Slightly red" (Uran. Oxon.).
94	120	64	— Tauri	5	38	30	+ 24	22.3	8	"Full red" (Dunsink).
95			55 Espin Aurigæ	5	38	4 ^I	+ 50	2.5	7	Reddish orange.
96			— Aurigæ	5	39	5	+ 30	39.4	7	Good red.
97	121	64a	— Geminorum	5	39	6	+ 20	38.9	$7\frac{1}{2}$	Good red. "Deep orange red" (Brodie). "? Var."
98	124		— Pictoris	5	40	8	-46	30.5	8	"Vivid red" (J. Herschel).
99			57 Espin Aurigæ	5	44	18	+ 32	5.8	$6\frac{1}{2}$	Fiery red. Near neb. 37 M.
100			11061 Lal. Ori- onis	5	44	22	+ 4	23.9	6	Deep orange. "Red" (Uran. Arg.).
101			56 Orionis	5	46	44	+ 1	49.7	5	Reddish orange, "Red" (Uran. Arg.).
102	127		a Orionis	5	49	13	+ 7	23.1	I	Reddish orange.

I	Tyre:	Number.		de la segonia	Ī		973				The second second
I	G. F. C.	Birm.	Dun- sink, Schj.	Star.		R. A			ecl. 390.	Mag.	Colour; Remarks.
	103	7		Gore's Nova Orionis	h. 5	m. 49		+ 20	9.6	$6\frac{1}{2}$	Fiery red. "Very red" (Robinson).
1	104	129		δ Aurigæ	5	50	28	+ 54	16.7	334	Pale orange.
ı	105	130	67	π Aurigæ	5	51	45	+ 45	55.5	41/2	Reddish orange. "Pale orange" (Brodie).
ı	106			13 Espin Aurigæ	6	0	5	- 5	51.0	$7\frac{1}{2}$	Reddish orange.
ı	*107	135	72	11684 Lal.Gemi- norum	6	4	3	+ 26	2.2	7 1/2	Good red.
1	108			14 Espin Aurigæ	6	4	56	+ 32	43.3	6	Reddish.
۱	109	136		Arg. + 21°: 1146 Geminorum	6	5	14	+ 21	53.6	7	Pale red.
	110	137		Arg. + 22°: 1220 Geminorum	6	5	39	+ 22	55.8	7	Red.
ı	111			15 Espin Aurigæ	6	6	48	+ 22	16.3	7	Reddish orange.
ı	112	141		Arg. + 39°: 1576 Aurigæ	6	9	3		30.6	$7\frac{1}{2}$	Pale red. "? Var."
ı	113			16 Espin Aurigæ	6	9	52	+ 30	53.7	7	Reddish.
ı	114			18 Espin Aurigæ	100	10	6		30.6	7	Deep red.
ı	115			62 Espin Aurigæ	6	10	14		14.8	9	Very red.
I	116		····	2029 B.A.C. Ge- minorum	6	12	42	+ 23	19.1	7	Pale orange. "Mag- nificent spectrum."
١	117	*		1183 H.P. Canis Majoris	6	12	48	-16	46.3	5	Red.
ı	118		THE PARTY	12104 Lal. Orionis	6	14	29	- 2	53.2	5	Deep orange. "? Var." "Yellowish red" (Wickham).
ı	119			∑ 895	6	14	55	+ 5	48.0		Fairly red.
ı	120			160 Espin Aurigæ	6	15	24	+ 47	43.0	81/2	"Red and probably var." (Espin).
	121			12169 Lal. Canis Majoris	6	15	57	-11	45.8	7	Fiery red. "Red" (Robinson
	122	143		μ Geminorum	6	16	81	+ 22	34.1	31/4	Reddish orange.
	123			5 Lyncis	6	17	12	+ 58	28.7	5 ½	Fiery red. In a striking group.
	124			3 Canis Majoris	6	18	5	-33	22.8	4	"Rich orange yellow" (Tupman).
	*125	144	74	— Geminorum	6	19	11	+ 14	46.8	7	Full deep orange. "? Var." "Yellowish" (Brodie).

	Number	r.					
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour ; Remarks.
126	145		— Canis Majoris	h. m. s. 6 19 16	-26 59·6	8	Pale crimsom. "Intense ruby" (J. Herschel). "Orange red" (Brodie).
127		insperied Cale Van	12359 Lal. Mo- nocerotis	6 21 31	- 4 23.7	7	Deep orange.
1,28			12524 Lal. Canis Majoris	6 25 25	-19 8.1	61/2	Orange.
129	•••		12545 Lal. Mo- nocerotis	6 26 50	- 8 5.2	5 <u>1</u>	Reddish orange. "Red" (Uran. Arg.).
130			20 Espin Mono- cerotis	6 28 19	- 2 59.8	71/2	Orange. Position approximate.
**131	- 148	78	2139 B.A.C. Aurigæ	6 28 59	+ 38 32.0	6	Deep fiery red.
132			21 Espin Aurigæ	6 31 2	+ 39 29.5	$6\frac{1}{2}$	Reddish orange.
133			ν² Canis Majoris	6 31 53	-19 9.7	4	Orange. "Red"(Robinson).
134	150		2196B.A.C.Pup- pis	6 35 57	-52 50.0	6	"De color rojizo" (Moesta).
135			22 Espin Aurigæ	6 36 33	+40 44.2	7	Double: A 8, pale orange; Bro,blue; dist.30".
136	151	79b	12907 Lal. Mo- nocerotis	6 36 41	- 9 3.5	$5\frac{1}{2}$	Orange.
137			23 Espin Gemi- norum	6 38 36	+ 24 46.5	$7\frac{1}{2}$	Fiery orange.
138	153	81	— Canis Majoris	6 41 14	-20 39.5	8	Pale red; near centre of cl. 41 M.
*139			13100 Lal. Mo- cerotis	6 42 22	- 8 52.4	$5\frac{1}{2}$	Reddish orange.
140			Arg. +61°: 915 Lyncis	6 43 10	+61 9.5	8	Red.
			0.11.77		0		
141	154		51 Cephei (Hev.)	6 48 46	+87 13.1		Full orange.
142	156	****	θ Canis Majoris		-11 54.1	44	Reddish orange.
143	157	•••	o¹ Canis Majoris		-24 2.7	15.50	Deep orange.
144	158	. "	μ Canis Majoris	Maria Carlo	-13 54.0	1000	Fiery red.
145	•		Arg8°: 1650 Monocerotis	6 52 49	- 8 52.6	7	Orange red.
146	161		2289 B. A. C. Puppis	6 53 20	-48 34.0	51/2	"De color rojizo" (Moesta).
147	160	83	1245 Groom. Camelopardi	6 53 24	+ 70 53.4	61/2	Pale red. Another star of same colour, mag. and decl. in the field.

	Number						
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
148			13627Lal. Mono- cerotis	h. m. s. 6 56 32	- 5 33.7	5 ½	Good orange. "? Var."
149			- Monocerotis	6 56 45	- 5 33.0	7	Pale orange.
150	162		22 Canis Majoris	6 57 20	-27 46.6	31/2	Fiery red. "Reddish" (Brodie). "?Var."
151	163	86	- Monocerotis	6 57 29	- 8 17.7	8	Red. In cl. 50 M. "Reddish" (Brodie).
**152	165	88	- Monocerotis	7 1 36	- 7 23.3	8	Crimson.
*153	167	88 b	R Canis Minoris	7 2 40	+ 10 11.9	7-10	Red. "Var."
*154	166	89	— Canis Majoris	7 2 55	-11 45.6	71/2	Decided red. A 9th mag. np.
155	•••		2337 B. A. C. —Geminorum	7 3 43	+ 13 44.3	61/2	Deep orange.
156	168	88 a	Camelopardi	7 7 56	+82 37.3	5 ¹ / ₄	Reddish orange.
157	170	91	14038 Lal. Gemi- norum	7 8 59	+ 22 9.4	7	Orange, or pale red.
158			L ² Puppis	7 10 10	-44 27.7	5	"Red and var." (Uran.
159			65 Espin Canis Majoris	7 12 0	-23 7.0	61/2	Wide pair. A 6½, orange; B 7, blue. "A probably var." (Espin).
160			14184 Lal. Mo- nocertis	7 12 9	- 6 28.7	$6\frac{1}{2}$	Reddish orange.
161	171		π Puppis	7 13 15	-36 54.0	3	"Beautiful orange" (Gore). "Very rich yellow" (Tupman).
162			66 Aurigæ	7 16 31	+40 53.1	$5\frac{1}{2}$	Orange.
163	175	94	— Canis Majoris	7 18 28	-25 32.4	7	Red.
164		•••	η Canis Majoris	7 19 44	-29 5·3	21/2	Perhaps purplish. "?Purple"(Tupman). "Pale red" (Smyth).
165			171 Espin Lyncis	7 20 10	+ 46 11.4	8	Fiery red.
166	178		14599 Lal. Mo- nocerotis	7 24 4	-10 5.9	6	Reddishorange. "?Var."
167	179		σ Argûs	7 25 44	-43 4.9	5	"Red" (Schmidt).
*168			14776 Lal. Pup- pis	7 28 44	-14 17.0	5	Fiery red. Precedes a brilliant field.
169	181	44	v Geminorum	7 29 9	+ 27 8.7	41/4	Orange.
170		•••	25 Espin Lyncis	7 29 38	+40 15.8	7	Reddish. The p star of a curious curve of 5 stars.
171	182		1444 H.P. Geminorum	7 34 20	+ 23 17.3	6	Fiery red.

	Number.			1	70.4		n			
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R.A.			ecl. 90.	Mag.	Colour; Remarks.
172			14952 Lal. Pup- pis		m. 34	8. 26	-16	35.5	6	Pale red.
173			26 Espin Canis Minoris	7	34	55	+ 4	19.4	7	Reddish orange. Position approximate. ? R.A. too great by 30°; and Decl. too little by 5'.
174			γ Monocerotis	7	36	0	- 9	17.7	41/4	Orange. "Reddish" (Robinson).
175	183	96	σ Geminorum	7	36	26	+ 29	9.0	41/2	Pale orange; an 8th mag. red star sp 39s.
176	186	97 b	15018 Lal. Mo- nocerotis	7	37	4	-10	37.2	8	Pale red.
177	187		Arg. + 5°: 1759 Canis Min.	7	37	33	+ 5	12.3	7	Pale red.
178	189		c Puppis	7	41	20	-37	42.1	4 1/2	"Orange"(J.Herschel). The chief star in neb. h
179			28 Espin Lyncis	7	42	43	+40	2.9	7	Good red.
180			176 Espin Canis Minoris	7	42	51	+ 5	42.0	9	Good red. ? Mag.
181			E Argûs	7	11	40	-21	35.0	31/2	Good orange.
182	196		2704 B. A. C. Lyncis		I	2		34.7	6	Orange.
*183			β Cancri	8	10	33	+ 9	31.4	4	Reddish orange.
184			16320 Lal. Hydræ	8	14	21	+ 3	6.6	81/2	Very red. "Vividly red" (Bellamy).
185	201		2820 B.A.C. Puppis	8	19	13	-37	55.9	6	"De color rojizo" (Moesta).
186			€ Argûs	8	20	15	-59	9.3	21/2	"Yellow; orange" (Tupman).
187			72 P. VIII. Puppis	8	20	18	-23	41.4	5½	Orange. "Orange" (Tupman).
188	205		17091 Lal. Hydræ	8	34	11	-19	21.1	61	Red.
189			3449 Lac. Mali	8	35	5	-28	41.5	7	"Orange" (Gore).
*190	211	115	17576 Lal. Cancri	8	49	II	+ 17	39.0	7	Pale crimson. "Rich orange red" (Brodie).
191	212		60 Cancri	8	49	56	+ 12	2.8	6–8	Reddish orange. "Probably var."
192	213.	116	17624 Lal. Hydræ	8	49	21	-10	57.5	71/2	Pale red: a blue star with a companion follows.
193		•••	σ¹ Ursæ Majoris	8	58	48	+ 67	19.1	51/4	Deep orange.

	Number.				D 1			7	,		No Vallagia
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R.A 1890			De:		Mag.	Colour; Remarks.
194		4	ω Hydræ	h. 9	m. O	s. II	+	5	31.8	5 ½	Deep orange. "Red"
195	217	119	3121 B.A.C. Mali (κ Pyxis)	9	3	13	_	25	24.6	434	Deep red.
196			λ Argûs	9	3	57	-	42	59.3	2 <u>I</u>	"Orange" (Tupman). "Blood red" (Pope).
197	218	120	Arg. + 31°: 1946 Cancri	9	4	0	+	31	24.7	61/2	Fiery red. "Pale orange" (Brodie). "Yar."
198	219		π^2 Cancri	9	9	10	+	15	24.0	5 ³ / ₄	Pale orange. The p star of a curious group of 4.
199			g Carinæ	9	13	5	70	57	4.9	41/2	"Deep orange red" (Tupman).
200	220		a (40) Lyncis	9	14	21	+	34	51.4	31/2	Reddish orange; a small blue star, nf, 123.
201	221		Arg. +0°: 2499 Hydræ	9	14	58	+	0	38.2	7	Reddish.
202			18688 Lal. Hy- dræ	9	24	8	+	20	16.0	61/2	Red.
203			— Ursæ Majoris	9	25	11	+	67	46.5	7	Orange. ?var. in colour. Decl. approximate.
204	224	•••	λ Leonis	9	25	27	+	23	27.3	41/2	Reddish orange. "Slightly red" (Uran. Oxon.).
205			N Velorum	9	27	53	-	56	32.9	33	"Very rich yellow" (Tupman).
206	226		ι Hydræ	9	34	14	-	- 0	38.7	41/4	Orange.
207			ε Leonis	9	39	36	+	24	16.8	3	Pale orange.
208			l Carinæ	9	41	13	-	-62	0.0	41/2	"Yellow; orange" (Tupman).
**209	228	123	R Leonis	9	41	39	+	II	56.5	5-10	Pale crimson. "Var."
*210	229	124	Ö-A. (2) 10163 Hydræ	9	45	59	-	- 22	30.2	7	Good red. "Distinctly red" (Bellamy).
211			66 Espin Ursæ Majoris	9	49	0	+	- 54	47.0	7	Dark orange. = 2412
212	230		- Velorum	9	50	57	-	-41	4.0	71/2	"Scarlet"(J.Herschel).
213			29 Espin Leonis	9	51	46	+	- 8	53.3	7	Reddish orange.
214	231		π Leonis	9	54	24	+	- 8	34.3	5	Reddish orange.
215			19580 Lal. Sex- tantis	9	55	25	-	- 2	39.5	7	Reddish.
216			19620 Lal. Hy- dræ	9	56	38	-	- 23	16.5	7	Reddish.

	Number.						
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
217			19687 Lal. Sex- tantis	h. m. s. 9 57 25	- 5 5.0	7	Reddish.
218	233		A (31) Leonis	10 2 4	+ 10 32.3	41/2	Deep orange.
219	234	127	18 Sextantis	10 5 29	- 7 52.4	53	Reddish orange.
220	235		2874 Brisb. Antliæ	10 7 5	-34 46.7	7	"Scarlet" (J. Herschel).
221			30 Espin Ursæ Majoris	10 10 50	+ 42 0.9	61/2	Fiery orange. "? Var."
222	·		q Carinæ	10 13 24	-60 47.3	4	"Orange red" (Tup-
223			V Velorum	10 15 29	-54 28.6	5	"Red" (Tupman).
224	238		μ Ursæ Majoris	10 15 47	+ 42 4.2	3	Orange.
225	239		μ Hydræ	10 20 46	-16 16.5	4	Reddish orange.
226			s Carinæ	10 23 50	-58 10.6	41	"Yellow; orange" (Tupman).
227			4367 Lac. Carinæ	10 28 28	-72 39.3	$5\frac{1}{2}$	"Deep orange" (Tup-
228	240		3630 B. A. C. Antliæ	10 30 20	-38 59.9	61/2	"Orange; almost scar- let" (J. Herschel).
229	241		r Carinæ	10 31 22	-56 59 3	51/2	"De color rojizo" (Moesta). "Orange red" (Tupman).
**230	242	132	3637 B. A. C. Hydræ	10 32 7	-12 48.7	5 ½	Fiery red. "Var. be- yond question" (Gould).
231			t ² Carinæ	10 34 34	-58 36.6	5	"Deep orange red" (Tupman).
232			— Ursæ Majoris	10 37 26	+67 9.3	6	Good pale red.
233		•••	4435 Lac. Carinæ	10 38 25	-58 38.4	6	"Red" (Brisbane).
234	245		4446 Lac. Carinæ	10 39 21	-59 59.4	6	"Red" (Brishane). "Deep orange red" (Tupman).
235	247		η Argûs	10 40 47	-59 6.5	6	"Var." (Tupman).
236			μ Argûs	10 42 2	-48 50.3	3	"Very red" (Tupman).
237	248	136	20918 Lal. Hydræ	10 46 16	-20 37.9	7	Pale crimson. "Very red" (Robinson) "Copper red. Most magnificent" (Dunsink).
238			u Carinæ	10 49 1	-58 16-1	$4\frac{1}{2}$	"Bright orange red" (Fupman).
239			— Leonis	10 50 0	+ 22 58.0	7	Orange. "Reddish yellow" (F. Brodie). Pos. approx.

	Number						
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
240			31 Espin Leonis	h. m. s. 10 52 45	+ 20 13.4	7	Reddish.
241			a Crateris	10 54 27	-17 42.9	41/2	Orange. "Red" (Robinson).
242	250	138	R Crateris	10.55 8	-17 44.0	8-9	Red. "Var." In the field with a Crateris.
243	254	•••	ψ Ursæ Majoris	11 3 29	+45 5.8	3	Reddish.
241			x Carinæ	11 3 53	-58 22.7	43/4	"Deep orange red" (Tupman).
**245	259	141	ν Ursæ Majoris	11 12 32	+ 33 41.7	33	Deep golden yellow.
246	 Uz		δ Crateris	11 13 50	-14 11.0	31/2	Reddish yellow. "Orange red" (Robinson).
247	261		e (87) Leonis	11 24 42	- 2 23.7	5	Orange.
248	262		λ Draconis	11 24 52	+69 56.3	4	Orange.
-249			v Leonis	11 31 19	- 0 13.0	$4\frac{1}{2}$	Reddish yellow.
250			ω Virginis	11 32 47	+ 8 44.5	$5\frac{1}{2}$	Pale Orange. "Red" (Uran. Arq.).
251			22104 Lal. Crateris	11 34 16	-16 1.5	6	Reddish.
252			4899 Lac. Muscæ	11 42 57	-66 12.9	5	"Red" (Tupman).
253	269		203 P. XI. Virginis	11 52 30	+ 4 6.5	8	? Brighter than mag. 8. ? another star near is 203 P.
254	270		1845 Groom. Ursæ Minoris	11 54 35	+81 28.1	6	Reddish.
255	7,500		5032 Lac. Crucis	12 2 40	-60 14.1	6	"Red" (Stone).
*256	272		€ Corvi	12 4 28	- 22 0.5	3	Reddish orange. "Reddish" (Robinson). "? Var."
257			€ Muscæ	12 11 38	-67 20.9	5	"Orange red" (Tup-
258			€ Crucis	12 15 26	-59 47.6	4	"Orange" (Tupman).
**259	277	145	— Virginis	12 19 37	+ 1 22.7	81/4	Good crimson.
260			71 Ursæ Majoris	12 19 48	+ 57 23.3	$5\frac{1}{2}$	Good orange.
*261	279		γ ComæBerenices	12 21 27	+ 28 52.9	43	Deep golden yellow.
262	281	148	- Virginis	12 24 44	+ 5 1.5	81/2	Deep red.
263	282		γ Crucis	12 25 3	-56 29.6	2	"Clear orange yellow" (Gould).
264			4 Draconis	12 25 19	+ 69 48.4	5 1/4	Reddish orange.

	Number.						V. Carlotte
G.F.C	Birm.	Dun- sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
265		•••	23649 Lal. Virginis	h. m. s. 12 33 49	- 5 ² 9·7	61/2	Reddish.
266			5250 Lac. Centauri	12 36 30	-48 12.5		"Intensely red" (Uran. Arg.).
*267	290	152	4287 B.A.C. Can. Venat.	12 39 57	+.46 2.4	$5\frac{1}{2}$	Red. "Good orange" (Brodie). "Probably var."
268	291	•••	— Crucis	12 40 58	-59 5.6	81/2	"Most intense blood red" (J. Herschel).
269	295		κ Crucis	12 47 7	-59 45.2	7	In neb. h 3435; "central and largest star red."
270		•••	ψ Virginis	12 48 38	- 8 56.4	5	Reddish orange. "Red" (Uran. Arg.).
271	298	155 b	— Draconis	12 52 5	+66 35.3	7	Pale crimson. "Deep orange" (Dunsink).
272	299	156	24148 Lal. Comæ Berenices	12 52 40	+ 18 21.6	8	Red. "Red tinge" (Brodie).
273	300		36 Comæ Bereni- ces	12 53 30	+18 0.1	5	Reddish yellow. "Perhaps var."
274			5460 Lac. Cen- tauri	13 10 8	-44 7.4	7	"Red" (Stone).
275	303	158	γ Hydræ	13 12 56	-22 35.4	31/2	Pale orange. "Red" (Brodie). "Perhaps var."
276	306	159	i Virginis	13 20 54	-12 8.1	$5\frac{1}{2}$	Reddish. "Yellowish red" (Brodie).
277	309		l ² (74) Virginis	13 26 14	- 5 41.1	5	Orange. "Red"
278	311		W.B. (2) XIII. 596 Comæ Ber.	13 31 48	+ 25 10-2	6	Orange tinge.
279			25213 Lal. Virginis	13 34 2	-15 53.3	61/2	Reddish.
280	312		83 Ursæ Majoris	13 36 34	+ 55 14.3	43/4	Golden. "? Var."
281	313		7561 Stone Hydre	13 42 49	-27 49.0	61/2	Red. "Splendid red." ? no such star here. ?Var. Double mags. 7, 10, Pos. 110° 77". \$\textit{B}. Mem. R. A. S.} xlvii. 280.
282			25462 Lal. Virginis	13 44 11	-20 19.4	7	Reddish.
283	314	162	v Boötis	13 44 11	+ 16 20.6	4	Orange "Probably var."
284	316	163	3105 Rad. Canum Venat.	13 48 29	+40 52.8	7	Orange.
285	318		π Hydræ	14 0 6	- 26 9.0	31/2	Deep orange.

	Number.			1						
	Number		Star.		R.A		De	ecl.	Vr.	C.I. D. I
G. F. C.	Birm.	Dun- sink, Schj.	Star.		1895			90.	Mag.	Colour; Remarks.
286	•••	·	θ Centauri	h. 14	m. 0	s. 13	-35	49.6	2	"Pale orange?" (Tup-
287	319		— Centauri	14	I	19	-59	12.2	8	"Double: both stars brick red" (J. Herschel).
288	320		13 Böotis	14	4	10	+49	58.6	$5\frac{1}{2}$	Orange.
289	321		4700 B.A.C. Virginis	14	4	51	-15	47.0	51/4	Rich orange.
290	322		κ Virginis	14	7	I	- 9	45.7	41/4	Orange. "Orange red" (Robinson).
291	323	•••	Centauri	14	9	0	-59	24.0	$7\frac{1}{2}$	"Ruby or high orange" (J. Herschel).
292	324	167b	4 Ursæ Minoris	14	9	17	+ 78	3.9	5	Orange.
293	325	167a	4732B.A.C.Ursæ Minoris	14	10	2	+ 69	57.0	5 4	Pale orange.
**294	326		a Böotis	14	10	39	+ 19	45.3	1	Golden yellow.
295		•••	Arg. + 30°: 2513 Böotis	14	17	23	+ 29	52.9	61/2	Reddish. "Orange red" (Espin).
*296	327	168	4775 B.A.C. Bö- otis	14	18	53	+ 8	35.2	7	Deep orange. "Yellow- ish red" (Brodie). "?Col. var."
297	328	169	26342 Lal. Böotis	14	19	14	+ 26	12.2	8	Pale red. "Ruby red" (Brodie). "? Var."
298			106 Virginis	14	22	53	- 6	24.3	6	Red.
299	330	171	ρ Böotis	14	27	5	+ 30	51.2	31/2	Orange. "Reddish" (Brodie). Yellow (Dunsink).
300	335		a Centauri	14	32	7	-60	22.5	1	"Red." "Rich yellow" (Tupman).
301	337	173d	34 Böotis	14	38	35	+ 26	59.8	5	Orange.
*302	339		€ Böotis	14	40	11	+ 27	32.3	21/2	Golden yellow.
303	340		58 Hydræ	14	43	50	-27	30.0	5	Red.
**304	341		β Ursæ Minoris	14	51	2	+74	36.3	2	Deep Golden yellow. "? Var."
305			— Libræ	14	51	42	-11	59.4	71/2	Red.
*306	342	•••	4949B.A.C.Ursæ Minoris	14	55	50	+ 66	22.2	43/4	Orange.
*307	343		20 Libræ	14	57	38	- 24	50.9	31/2	Orange red. "Red- dish" (Bellamy). "Red (Robinson). "Not red" (Washburn Obs.)
308	344		ν^1 Libræ	15	0	29	-15	49.7	$5\frac{1}{2}$	Reddish orange.
309		1	4984 B.A.C. Libræ	15	3	26	-23	33.9	$7\frac{1}{2}$	Good red.

	Number	1					1 3			
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R. A.			ecl.	Mag.	Colour; Remarks.
310	345		4976 B.A.C. Triang. Aust.	h. 15		s. 46	-69	39.8	6	"Almost scarlet" (J. Herschel). 'Red" (Stone).
311	345		δ Lupi	15	II	8	-29	44.6	5	Red.
312	347		— Apodis	15	14	3	-75	32.0	7	"Very high red" (J. Herschel).
313			ϕ' Lupi	15	14	49	-35	51.7	31/2	"Very red" (Gould). "Reddish yellow" (Williams).
314	351		II UrsæMinoris	15	17	12	+72	13.4	5	Reddish.
315			ε Trianguli Australis	15	26	39	-65	56.7	41/2	"Orange" (Tupman).
316	355		39 Libræ	15	30	21	-27	46.2	4	Decided red. "Not red" (Wushburn Obs.),
317			68 Espin Coronæ Borealis	15	33	31	+ 24	52.8	7	Orange.
*318	357		θ Ursæ Minoris	15	34	41	+ 77	42.9	$5\frac{1}{4}$	Orange.
319			κ Libræ	15	35	36	-19	19.3	5	Reddish orange.
320	358		κ Serpentis	15	43	47	+18	28.9	4	Orange.
*321	363		ρ Serpentis	15	46	25	+ 2 I	18.6	43	Pale orange.
322	365		θ Libræ	15	47	33	-16	24.5	41/4	Pale Orange.
323	•••		28997 Lal. Libræ	15	50	57	-15	43.0	63	Red. "Reddish" (Robinson).
324	367	•••	Arg. + 47°: 2291 Coronæ Bor.	15	59	25	+ 47	32.3	7	Reddish orange.
325			6661 Lac.Normæ	15	59	42	-52	46.9	63	"Red" (Stone).
326	•••		5347 B.A.C. Scorpii	16	I	25	- 26	1.9	53	Good red.
327	369	185	W.B. (2) XV. 1569 Herculis	16	2	37	+ 22	7.0	61/2	Reddishyellow. "Straw colour" (Washburn Obs.). "Pale yellowish red" (Brodie).
328			— Scorpii	16	3	3	-26	9.6	$7\frac{1}{2}$	Red. ? mag and colour.
329	370		47 Serpentis	16	3	10	+ 8	50.2	5 3	Decidedly reddish.
330			Arg. +9°: 3151 Serpentis	16	3	19	+ 8	55.2	$7\frac{1}{2}$	Orange.
**331	373		δ Ophiuchi	16	8	35	- 3	24.6	23/4	Reddish orange. "Orange red" (Robinson).
332	374		- Normæ	16	10	6	-45	32.0	81/2	"Ruby red" (J. Her-schel).
**333	376		ν ¹ Coronæ Borealis	16	18	13	+ 34	4.5	5	Orange.

1	Number			D.I.	Dul		
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R.A. 1890.	Decl. 1890.	Маз.	Colour; Remarks.
**334	377		ν² Coronæ Borealis	h. m. s. 16 18 21	+ 33 57.4	5	Orange. ν^1 is nearly the same in colour.
**335	381		a Scorpii	16 22 40	-26 11.2	1	Fiery red: double,
336	383		β Herculis	16 25 30	+ 21 43.8	2 3/4	Golden. There is a red star 3° nf. mag. 7.
337			69EspinHerculis	16 27 0	+ 35 27.6	61/2	Reddish orange.
338	384		III P. XVI. Scorpii	16 29 8	-35 1.7	5 ½	"Red."
339	385		Scorpii	16 33 34	-32 9.7	8	"Deep red, like a drop of blood" (J. Herschel).
340		•••	a Trianguli Australis	16 37 1	-68 49.5	21/4	"Orange; yellow" (Tupman).
341			η Aræ	16 40 17	-58 50.6	4	"Orange" (Tupman).
342			€ Scorpii	16 43 3	-34 5.5	21/4	"Orange; yellow" (Tupman).
343			ζ ² Scorpii	16 46 50	-42 10.3	3	"Deep orange yellow" (Williams).
344			ζ Aræ	16 49 31	-55 48.9	4	"Bright orange" (Tupman.)
345	399		30 Ophiuchi	16 55 16	- 4 3.5	5	Reddish orange. "Pro- bably var."
**346	402		a¹ Herculis	17 9 38	+ 14 31.0	$3\frac{1}{2}$	Deep orange. "Red-dish" (Robinson). "Var."
347			— Ophiuchi	17 9 59	-15 5.3	7 1/2	Fiery red.
348	404		π Herculis	17 11 13	+ 36 56.1	31/2	Fiery orange. "?Var."
349	407	•••	— Ophiuchi	17 14 14	+ 2 16.2	7	Red,
350			73 Espin Her- culis	17 15 50	+17 9.9	71/2	Red. ? Decl. too great.
351			β Aræ	17 16 9	-55 25.6	3	"Deep bright orange" (Tupman).
352	408		43 Ophiuchi	17 16 26	-28 2.3	$5\frac{1}{2}$	Reddish.
353			δ Aræ	17 21 10	-60 35.4	3	"Pale orange" (Tup-
354	409	•	— Scorpii	17 22 49	-35 33.1	9	"Very deep red" (J. Herschel).
**355	410	202	— Ophiuchi	17 23 14	-19 23.1	8	Very decided red. "Ruby star" (J. Herschel). "Deep red, nearly crimson" (Brodie).
356	418	205	Serpentis .	17 38 28	-18 36.4	8-9	Very little colour. "Very deep red" (Dunsink). "Probably var. in colour and mag."

	Number						
G. F. C.	Birm.	Dun- sink, Schj.	Star.	R. A. 1890.	Decl. 1890.	Mag.	Colour; Remarks.
357			76 Espin Herculis	h. m. s. 17 42 58	+ 36 7.4	61/2	Reddish orange.
358			77 Espin Her- culis	17 44 4	+ 36 35.6	61/2	Reddish orange.
359			79 Espin Ophi- uchi	17 46 27	+ 1 8.1	7	Red. ? 886 Weisse.
360			80 Espin Ophi- uchi	17 46 57	+ 1 20.4	61/2	Fiery red. Fine field.
361	422	207	— Ophiuchi	17 52 32	+ 2 44.0	7	Reddish. "? Var."
**362	423		γ Draconis	17 54 3	+ 51 30.1	$2\frac{I}{2}$	Fiery orange.
363	425		γ ² Sagittarii	17 58 44	-30 25.4	3	Reddish orange.
364	•••		7634 Lac. Sagit- tarii	18 8 3	-29 51.3	7 ½	"Reddish" (Wush- burn Obs.).
365			81 Espin Her- culis	18 12 55	+ 17 55.5	7	Red.
366	433		Arg. + 23°: 3299 Herculis	18 13 32	+ 23 14.3	7	Orange,
367	434		δ Sagittarii	18 13 57	-29 52.5	23	Orange red.
*368	437	211a	33896 Lal. Her- culis	18 16 57	+ 25 0.2	71/2	Rich orange. "No red star here" (Washburn Obs.). "No colour" (Dunsink). ?R.A. too great by 1 ^m 28°; Decl. too great by 35'.
369	439		21 Sagittarii	18 18 46	-20 36.1	5	Red.
370	441		λ Sagittarii	18 21 11	-25 28.9	3	Orange.
**371	446	213	6306 B.A.C. Sagittarii	18 26 27	-14 56.7	5 ³ / ₄	Fiery red. "Golden yellow" (Brodie). "Reddish" (Bellamy). "Not red" (Dunsink).
** 372	448		Arg. + 36°: 3168 Lyræ	18 28 30	+ 36 54.5	- 8	Decided crimson.
*373	449		1 Aquilæ	18 29 13	- 8 18.9	4	Orange.
374			82 Espin Lyræ	18 30 23	+ 38 21.1	7	Red.
375	452		6341 B.A.C.Her- culis	18 30 57	+ 23 30.0	. 54	Orange.
376	457		34746 Lal. Aquilæ	18 38 22	- 6:38.9	7	Reddish.
**377	464	219	—Scuti Sobieskii	18 43 57	- 8 1.9	8	Rich fiery red. "? Var." "Orange" (Brodie).

	Number.				R. A.		D	ecl,		
G. F. C.	Birm.	Dun- sink, Schj.	Star.		1890.			90.	Mag.	Colour; Remarks.
*378	466		ν¹ Sagittarii		m. 47		o -22	52.8	5	Red.
379	470	•••	δ² Lyræ	18	50	39	+ 36	45.5	41/2	Fiery orange. Good field.
380			9 Aquilæ	18	51	10	- 5	59.3	5	Orange "red" (Uran. Arg.).
*381	471		£2 Sagittarii	18	51	9	-21	15.1	31/2	Orange.
382	472		W.B. (2) XVIII. 1528 Herculis	18	51	15	+ 17	58.3	53	Pale orange.
*383	475	222	— Aquilæ	18	52	31	+ 14	12.6	9	"Deep fiery red" (Dunsink). Probably var. (G. F. C.)
384			87 Espin Lyræ	18	53	16	+ 36	19.3	7	Orange.
385	476		Arg. + 38°: 3362 Lyræ	18	53	23	+ 38	39.2	7 1/2	Pale orange.
**386	478		12 Aquilæ	18	55	47	- 5	53.5	4	Orange. "? Var."
387	479		λ Lyræ	18	55	51	+ 31	59.4	54	Orange. "? Var."
388	480	222a	35562 Lal. Aquilæ	18	57	4	+ 8	12.8	61	Orange.
389	482	222b	35624 Lal. Aquilæ	18	58	15	+ 8	7.9	8	Decided yellow: Good orange. "White" Dunsink). ? Colour var.
**390	483	222c	35611 Lal. Aquilæ	18	58	32	- 5	50.9	7 1/2	Very fine fiery red. "? Var." "Decided red" (Brodie). "Deep red" (Wickham). "Copper red" (Dunsink).
391	485		τ Sagittarii	19	0	5	- 27	49.6	3 1/2	Reddish orange.
392	487	225	35928 Lal. Vulpeculæ	19	4	2	+ 24	0.3	7	Red.
393			89 Espin Lyræ	19	4	28	+ 38	58-7	7	Orange. = 78 Weisse.
394	490		Arg. + 18°: 4011 Sagittæ	19	10	42	+ 18	19.8	7	Orange,
395	492		— Lyræ	19	14	49	+ 27	3.2	9	Red. "?Var." Mag.7½?
** 396			4 Vulpeculæ	19	20	38	+ 19	35.0	51/4	Orange; fine field. Includes 2 other orange stars.
*397			94 Espin Cygni	19	21	44	+ 50	1.0	7	Fiery red.
398	498		Arg. + 1°: 4004 Aquilæ	19	22	17	+ 1	57.2	8	Reddish. "? Var."
399	499		Arg. + 2°: 3904 Aquilæ	19	24	39	+ 2	40.6	61	Reddish orange.
400	500	227	e (36) Aquilæ	19	24	54	- 3	1.1	51/4	Reddish orange. "Light orange" (Brodie). "Yellow" (Dunsink).

	37				1		
	Number.		Star.	R.A.	Decl.	Mag.	Colour ; Remarks.
G. F. C.	Birm.	Dun- sink, Schj.	otar.	1890.	1890	mag.	Colour ; Remarks.
401			179 Espin Cygni	h. m. s. 19 25 21	+ 45 48.9	8	Pale crimson. "Very red; ? Var." Espin).
**402	502	•••	6702 B.A.C. Draconis	19 25 30	+ 76 21.1	61	Strong fiery red. "? Var." "Reddish Orange" (Brodie).
**403	503		β Cygni	19 26 17	+ 27 43.7	3	Yellow, with a 7th mag. comes blue. Dist. 34". "? Var."
404	504		Arg. +4°: 4152 Aquilæ	19 27 43	+ 4 47.6	7	Reddish orange.
*405	505	228	36981 Lal. Sagittarii	19 28 0	-16 36.6	7½	Orange. "Good ruby" J. Herschel). "Intense red" (Dunsink, 1875). "Flery red" (Gore, 1876). "Red; deeper at times" (Bellamy). !Var.incolour; no trace of ruby (G.F.C.). Crimson (G.F.C.).
406	506		Arg. + 5°: 4190 Aquilæ	19 28 23	+ 5 13.5	7	Orange.
407	511		Arg. + 12°: 4060 Aquilæ	19 39 29	+12 58.0	7	Reddish. Most southerly of 3 stars in a row.
*408			101 Espin Cygni	19 40 16	+40 26.6	6	Fiery red.
409	512		γ Aquilæ	19 41 2	+10 20.7	23/4	Brilliant orange. "Reddish yellow" (Robinson).
410	518	232	χ Cygni	19 46 20	+ 32 38-2	Var. 4-0	Fiery red, when approaching max.
411	519		19 Cygni	19 46 39	+ 38 26.1	$5\frac{1}{2}$	Full orange.
412			109EspinSagittæ	19 55 8	+17 18-3	$7\frac{1}{2}$	Orange; there is a red ofth mag. nf.
413	522		c Sagittarii	19 55 53	-28 I.o	43	Reddish orange.
414			38428 Lal. Cygni	19 59 41	+ 38 0.6		Reddish.
415	526		Ö-Arg. (2) 20234 Sagittarii	20 0 12	-27 32.5	7	Deep red. "Ruby" (J. Herschel). "Deep orange red" (Brodie)
416	530		Arg. + 16°: 4153 Sagittæ	20 3 8	+ 16 21.4	61/2	Orange.
*417	538		66 Aquilæ	20 7 33	- 1 20.3	534	Orange.
418	541		Arg. + 38°: 3957 Cygni	20 9 24	+ 38 23.7	8	Decided red.
*419	545	238	Ö-Arg.(2) 20363 Capricorni	20 10 40	-21 38.3	71/2	Decided red. "Perhaps the finest of my ruby stars" (J. Herschel.) "Deep ruby; fine colour" (Brodie). "Bright ruby" (Bellamy).
420	546	•••	23 Vulpeculæ	20 11 13	+ 27 28.6	43/4	Full orange.

Pat 1	Number.									
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R. A. 890		De 180		Mag.	Colour; Remarks.
421	549		o² (32) Cygni	h. 20		s. 5	0 + 47	22.6	41/2	Pale orange.
422	551		6986 B.A.C. Cygni	20	12	59	+40	1.3	$5\frac{1}{2}$	Reddish orange.
423	553	239 a	U Cygni	20	16	12	+ 47	32.9	7-11	Very red. "Remarkable ruby." "Var." In striking contrast with a blue star n/.
424			115 Espin Cygni	20	17	37	+ 53	14.2	7	Reddish.
425	556		— Aquilæ	20	19	10	+ 0	11.8	10	Reddish. ? Var. Mag. 8}, Aug. 9, 1885.
426	557		39 Cygni	20	19	28	+ 31	50-1	$4\frac{1}{2}$	Orange.
427	558	241	39304 Lal. Del- phini	20	20	27	+ 9	42.0	7	Orange. "Probably
428	559		— Capricorni	20	21	12	- 28	37.4	8	Decided red. "Fine ruby" (J. Herschel).
*429			117 Espin Del- phini	20	24	2	+ 15	53.8	81/2	Good red. There is a blue 8th Mag. S.
430		•	Arg. + 39°: 4208 Cygni	20	24	50	+ 39	36.7	9	Fiery red. "Colour very fine" (Espin).
431	563	•••	47 Cygni			37		52.4	434	Orange.
*432	566	•••	Arg. + 17°: 4370 Delphini	20	32	54	+ 17	52.7	7	Full orange.
433	569	···	Arg. + 17°: 4401 Delphini	20	40	25	+ 17	41.5	7	Reddish. "Probably var."
434			119 Espin Cygni	20	43	4	+ 45	38.7	81/2	Pale ruby.
435			121 Espin Cygni	20	46	8	+ 50	22.0	7 1/2	Red.
436			122 Espin Cygni	20	47	20	+ 40	42.6	7	Deep orange.
437	572		Arg. + 32°: 3980			26	+ 33	0.0	534	Orange.
438			Cygni 3 Equulei	20	59	6	+ 5	3.9	5 3	Red. "Red" (Uran.
439	575	•••	A Capricorni	21	0	42	-25	26.7	41/2	Deep orange.
440			124 Espin Cygni	21		40		12.4	$7\frac{1}{2}$	Orange; a blue 74 mag. to the N.
*441	579	247	61 P. XXI. Cephei	21	9	59	+ 59	38.6	$7\frac{1}{2}$	Remarkable fiery red.
442	580		8745 Lac. Indi	21	14	19	-70	11.7	6	"Red, inclining to orange" (J. Herschel).
443	•••		125 Espin Cygni	21	14	58	+49	36.1	7	Fiery red.
*444	582	248b	— Cygni	21	18	16	+41	55.5	9	Deep red. A reddish star follows 15°, and 20″ s.

	Number.				D 4					
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R. A 1890	·.		ecl. 390.	Mag.	Colour; Remarks.
445			184 Espin Cygni	h. 21	m. 19		+ 40	28.1	7 1/2	Red.
*446	583		2 Pegasi	21	24	58	+ 23	9.4	43	Bright orange.
447	585		Arg. + 45°: 3584 Cygni	21	29	9	+ 45	21.9	-7	Reddish orange.
448	587		Arg. + 44°: 3877 Cygni	21	31	53	+ 44	53.1	7	Reddish orange.
449	589	249a	889 Bess. Cygni	21	37	23	+ 35	0.4	7	Unmistakable fieryred.
450	590		— Cygni	21	37	24	+ 42	20.4	7	Strong reddish tinge. "Schmidt's Nova of 1876."
**451	591		€ Pegasi	21	38	47	+ 9	22.2	21/2	Full orange. "Probably var."
**452	592	251	923 Bess. Cygni	21	38	43	+ 37	30.7	8	Deep fiery red or pale crimson. "Good red" (Brodie).
**453	594	253	μ Cephei	21	40	8	+ 58	16.5	4-6	Intense reddish orange. "Light orange" (Brodie)
**454	596	254	42431 Lal. Aquarii	21	40	50	- 2	43.4	61/2	Decided red. "? Var." "Fine red" (Dunsink).
*455	599		7658 B.A.C. Cephei	21	53	33	+63	5.7	54	Fiery orange.
*456			133Espin Cephei	21	54	22	+ 65	37.6	$6\frac{1}{2}$	Fiery red. Blue star 6½ mag. near, p.
*457	600	258	— Pegasi	21	58	59	+ 27	49·I	$7\frac{1}{2}$	Fiery red. "Orange tinge" (Brodie). "? Var."
458	601		18 Cephei	22	0	39	+62	33.8	$5\frac{1}{2}$	Reddish orange.
459	602	9	20 Cephei	22	1	40	+62	14.9	5 I	Orange.
460			134 Espin La- certæ	22	6	30	+ 39	9.9	71/4	Reddish.
461	604		ζ Cephei	22	7	3	+ = 7	39.5	$3\frac{1}{2}$	Pale orange.
462	606		7766 B. A. C. Cephei	22	200	56	Con la	43.2	6	Reddish orange.
463	607	260	7765 B. A. C. Lacertæ	22	9	9	+ 39	10-0	4 <u>1</u>	Orange.
464	609	261	43501Lal.Pegasi	22	11	56	+ 4	35.8	73/4	Dull pale red. "Tinge of red" (Brodie).
465	610	262	7813 B. A. C. Cephei	22	18	59	+ 55	24.4	7	Good red.
466			36 Pegasi	22	23	39	+ 8	34.1	6	Reddish orange. "Red" (Uran. Arg.).
467	612		5 Lacertæ	22	24	57	+ 47	8.7	41/2	Reddish orange.

	Number.				D A		D			
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R.A 1890			eel. 90.	Mag.	Colour; Remarks.
468	613	262a	δ Cephei	h. 22	m. 25	s. 5	+ 57	51.1	$3\frac{1}{2}-4\frac{1}{2}$	Orange; with blue com- panion in good contrast "Var."
469			136 Espin Cephei	22	30	23	+ 57	36.1	7 1/2	Fiery red.
470			Arg. + 57°: 2568 Cephei	22	32	16	+ 57	51.4	74	Red. "Var. 7-8"
471	615		Arg. + 56°: 2821 Cephei	22	34	18	+ 56	13.6	51/2	Reddish.
472	616		11 Lacertæ		35	40	+43	42.1	43	Reddish orange.
473	617		β Gruis	22	36	6	-47	27.7	3	"Reddish." "Orange' (Williams).
*474	620	•••	7º Aquarii	100	44			10.1	4	Orange. "? Var."
475	622	•••	15 Lacertæ	22	47	5	+ 42	43.7	5	Reddish orange.
476			138 Espin La- certæ	22	52	25	+ 42	25.1	7	Orange.
477	625	263	267 P. XXII. Aquarii	22	53	8	-25	45.0	6	Reddish. "Pale red' (Brodie).
**478	627	264a	β Pegasi	22	58	25	+ 27	29.0	21/2	Rich golden.
**479	629	266	55 Pegasi	23	I	27	+ 8	48.8	4 ½	Orange.
480	630	266 a	57 Pegasi	23	3	59	+ 8	4.8	$5\frac{1}{2}$	Reddish orange.
481	631	•••	631 B Aquarii	23	8	2	-13	59.5	7	Reddish. "Double. A 7; B 10; dist. 1'40"."
482	632	•••	φ Aquarii	23	8	37	- 6	38.3	41	Deep orange.
483	633	·	ψ¹ Aquarii	23	10	5	- 9	41.1	41/2	Orange.
484	634		χ Aquarii	23	11	9	- 8	19.4	51/4	Orange.
**485	635	267	8 Andromedæ	23	12	38	+ 48	24.9	5	Fiery red. "Orange red" (Brodie).
486	637	268	262 Bess. Pegasi	23	14	44	+ 22	29.4	7	Orange. "Var."
487	642	272	46112 Lal. Pegasi	23	27	0	+ 23	14.3	7	Pale orange.
488	643	272a	71 Pegasi	23	27	57	+ 21	53.5	$5\frac{1}{2}$	Deep orange.
489	644	:"	λ Andromedæ	23	32	10	+ 45	51.7	4	Orange.
490	645		77 Pegasi	23	37	46	+ 9	43.2	5 1/2	Deep orange.
491	647		78 Pegasi	23	38	27	+ 28	45·I	5	Pale orange.
**492	648	273	19 Piscium	23	40	45	+ 2	52.5	54	Decided red. "Probably var."
493	651	276	4154 Groom. Cephei	23	47	2	+74	55.8	61	Reddish orange.
494	653	,	235 P. XXIII. Pegasi	23	51	5	+ 22	2.1	6	Reddish. "Slightly red" (Uran. Oxon.).

3/21	Number.									
G. F. C.	Birm.	Dun- sink, Schj.	Star.		R. A 1890).	18	ecl. 190.	Mag.	Colour; Remarks.
495	6 54		9659 Lac. Sculptoris		m. 51		0 -27	142	61/2	Reddish.
**496	655		ψ Pegasi	23	52	9	+ 24	31.9	4 <u>1</u>	Reddish yellow,
**497	656	278	R Cassiopeiæ	23	52	49	+ 50	46.5	5-12	Very red. "Vivid red" (Brodie). "Var."
**498	658	280	6259 Rad. Cassi- opeiæ	23	55	39	+ 59	44.5	8	Very fiery red. A 9th mag. blue star near.
*499			30 Piscium	23	56	19	- 6	37.5	41/2	Fiery red. "Red" (Uran. Arg.).
500			33 Piscium	23	59	42	- 6	19.4	43	Orange. "Red" (Uran. Arg.).
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CHAPTER XIII.

A CATALOGUE OF KNOWN AND SUSPECTED BINARY STARS.

THE materials for this Catalogue have been selected from the latest and most trustworthy sources available, and no pains have been spared to make it fairly complete; but data for the compilation of such a list as this, even in an elementary form, are rather scarce, though less so than formerly.

The signs + and - in the last two columns indicate, it need hardly be said, that the position angle or the distance is increasing or diminishing as the case may be. A note of interrogation (?) denotes probability without certainty, but \pm ? means that it is wholly impossible, owing to the discordances in the measures, to pronounce an opinion one way or the other.

The "Struve" numbers, which are within brackets, refer to O. Struve's Catalogue.

The measures given in the last 2 columns are as a rule all as recent as 1880-6, the new and valuable results of Engelmann and Perrotin^a having been utilised as much as possible.

^{*} For the titles of these and of other Catalogues of Double Stars, see Vol. II. p. 495.

PART I.—KNOWN BINARY STARS.

					1			
No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+	Mag.	Position.	Distance.
			h. m. s.	0,		,		
1	8372 B.A.C. Cassiop.	3062	0 0 28	+ 57 49.2	80.5	7 8	303+	1.57+
2	316 B Cephei	2	0 3 13	+79 6.0	80.5	61 7	single -	single -?
3	1007 h Andromedæ	[2]	0 7 57	+ 26 23.0	83.8	7 81/2	38-	0.71+?
4	318 B Cephei	13	0 9 57	+76 20.0	80.6	$7 7\frac{1}{2}$	97-	075±?
5	λ Cassiopeiæ		0 25 41	+ 53 54.9	80.6	6 61	144+	0·47 ± ?
						1110		
6	η Cassiopeiæ	60	0 42 26	+ 57 13.9	82.8	4 7 1 2	165+	5.1 —
7	66 Piscium	[20]	0 48 45	+ 18 35.6	80.7	6 7	8_	0.41 + ?
8	36 Andromedæ	73	0 49 4	+ 23 2.0	85.2	6 7	2 +	1.3 +
9	251 P.O. Piscium	80	0 53 45	- 0 11.4	85.2	8 9	315+	20.5 +
10	42 Ceti	113	1 14 11	- I 5·2	77.0	6 8	348+	I-3 ±?
	T. D.T. Di.				06.	610		
11	123 P.I. Piscium	138	1 30 17	+ 7 5.0	86.9	61 61	216+	1.3 -?
12	p (6) Eridani		I 35 37	-56 45.2	80.4	$6\frac{1}{2} 6\frac{1}{2}$	234±?	6.3 +
13	586 B.A.C. Piscium	186	I 50 12	+ 1 18.2	78.8	$7 7\frac{1}{2}$	169 + ?	0.31 —
14	a Piscium	202	1 56 21	+ 2 14.0	83.8	3 4	323-	2.9 -
15	γ^2 Andromedæ	[38]	1 57 8	+41 48.1	83.8	5 64	103-	0.40-?
16	259 B Andromedæ	228	2 6 59	+ 46 56.1	83.5	7 8	348+	0.31 —
17	257 ∑ Persei	257	2 16 37	+61 3.2	74.2	7 8	181 -?	0.46 + ?
18	i Cassiopeiæ AB	262	2 20 0	+66 54.4	86.0	$4\frac{1}{2}$ 7	176-	4.9 +
19	278 ∑ Cassiopeiæ	278	2 29 18	+68 15.0	70.4	8 81	76±3	0.56+?
20	114 B. Arietis	305	2 41 15	+ 18 54.5	82.9	7 8	318-	3.0 +
		3-5	- 43	1 20 54 5		1	310-	3.0
21	ε Arietis	333	2 52 55	+ 20 54.0	83.8	5 61/2	198+	1.21 +
22	367 ∑ Ceti	367	3 8 23	+ 0 19.8	78.9	8 8	246-	0.63-
23	7 Tauri AB	412	3 27 55	+24 5.7	84.0	6 61	224-	0.39-
24	98 P. III. Eridani	422	3 31 8	+ 0 13.9	84.4	6 8	244+	6.2 +
25	49 Hev. Cephei	460	3 51 31	+80 24.3	83.2	5 1 6 1	35+	0.9 ±?
26	511 ∑ Camelopardi	511	4 8 41	+ 58 30.7	83.0	6 7	284-	0·46 ± ?
27	55 Tauri	[79]	4 13 36	+ 16 15.5	79.0	6 7	58+	0·44 ± ?
28	230 B Tauri	535	4 17 12	+11 6.9	84.0	7 8	337-	1.8 -?
29	2 Camelopardi	566	4 31 13	+ 53 15.4	82.9	$5\frac{1}{2} \ 7\frac{1}{2}$	291 -	1.8 ±?
30	577 ∑ Aurigæ	577	4 34 50	+ 37 18.6	85.1	71 8	73-	1.4 ± !
								ALE IN

			1	1	1	1	1	110000
No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+	Mag.	Position.	Distance.
	TEAS DE LE		h. m. s.	0 /			0	"
31	i Orionis	[98]	5 1 54	+ 8 21	84.2	6 7	202	0.99
32	118 Tauri	716	5 22 30	+ 25 3.6	82.1	6 7	199+	5·1 ±?
33	A (32) Orionis	728	5 24 54	+ 5 52.0	82.9	5 7	192-	0.34-
34	380 B Tauri	742	5 29 50	+21 55.9	83.6	$7 7\frac{1}{2}$	257 +	3·4 ±?
35	932 ∑ Geminorum	932	6 28 5	+ 14 49.9	83.8	8 81/2	327	2.3
5 2 4								
36	{ Lyncis AB , AC	948	6 36 30	+ 59 33-1	§82·7	5 6	128-	1.7 +
3-					182.2	5 7	126+	8.3 -?
37	a Canis Majoris		6 40 18	-16 33.7	86.2	1 9	30-	7.4 -?
38	15 Lyncis	[159]	6 47 45	+ 58 34.3	83.2	5 6	0-	0.7 +
39	e (38) Geminorum	982	6 48 26	+13 19.1	82.9	5 8	163-	6.2 +
40	1037 ∑ Geminorum	1037	7 5 58	+ 27 24.7	84.1	$7 7\frac{1}{2}$	310-	1.2 -?
Top !						- The said	TE LET	
41	a Geminorum	1110	7 27 35	+32 7.8	86.3	2 3	232-	5.7 +
42	1157 \(\text{Monocerotis} \)	1157	7 49 1	- 2 29.9	82.2	8 81/4	250	1.4
43	85 B Lyneis	1187	8 2 33	+ 32 34.9	84.1	$7 7\frac{1}{2}$	47-	2.0 +
44	S Cancri AB	1196	8 5 54	+18 0.9	{86.3	6 7	56-	1.08+
1318	{ ,, AC }	-190	3 34		184.2	$6 7\frac{1}{2}$	125-	5.7 + ?
45	1216 ∑ Hydræ	1216	8 15 46	- I I4·9	79.2	$7 7\frac{1}{2}$	160+	0.37 - ?
								131
46	€ Hydræ	1273	8 40 57	+ 6 49.3	82.9	4 81/2	226+	3·4 ±?
47	ι Ursæ Majoris		8 51 41	+48 28.4	83.4	3 11	356+	9.5 -
48	σ² Ursæ Majoris	1306	9 0 44	+67 35.0	82.8	5 8	238-	2.6 -
49	3121 \(\Sigma\) Cancri	3121	9 11 19	+ 29 4.4	80.3	7 74	199+	o⋅5 ±?
50	157 B Lyncis	1338	9 14 7	+ 38 39-1	82.3	7 8	153+	1.8 +
			18 5 17 6					37 25 23
51	ω Leonis	1356	9 22 34	+ 9 32.2	86.3	6 7	92+	0.7 +
52	30 B Leonis Minoris	1374	9 34 33	+39 27.1	84.1	7 8	282+	32 -
53	161 P. IX. Sextantis	1377	9 37 45	+ 3 7.9	71.1	8 10	141+	3.5 -!
54	φ Ursæ Majoris	[208]	9 44 38	+ 54 34.6	82.2	5 54	139	0.2
55	8 Sextantis	•••	9 47 4	- 7 34.6		$6 6\frac{1}{2}$		
,	DATE	-	Mad legitical	0	0		100	
56	23 P. X. Leonis	[215]	10 10 17	+ 18 17-4	85.)	7 7	219-	1.0 +
57	γ Leonis AB	1424	10 13 54	+ 20 23.8	85.1	2 4	113+	3.4 +
58	145 B Leonis	1426	10 14 47	+ 6 59.2	83.5	$7\frac{1}{2}$ 8	276+	0.9 +
59	1457 ≥ Sextantis	1457	10 32 59	+ 6 18.5	84.1	$7\frac{1}{2}$ $8\frac{1}{2}$	314+	1.3 +
60	Ursæ Majoris	1523	II I2 20	+ 32 9.5	86-3	$4 5\frac{1}{2}$	237-	2.0 +
Service .	CHI DIES THE PARTY OF	THE WAY			1-	SEE LAND	HIEROT	2000

			bill to street			2000	100	
No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
			h. m. s.	0 /			0	"
61	ι Leonis	1536	11 18 11	+11. 8.4	84.2	4 8	64-	2.6 +
62	126 South Ursæ Maj.	[234]	11 24 51	+41 54.2	80.3	7 71/2	178+?	0.18+
63	235 ∑ Ursæ Majoris	[235]	11 26 3	+61 41.2	82.6	6 74	64+	1.2 +
64	191 B Virginis	1647	12 24 57	+ 10 20.0	85.3	71 8	217+	1.4 +
65	γ Centauri		12 35 28	-48 21.5	80.4	4 4	1	1.4
66	77.				0			
	γ Virginis J1678 Σ Comæ } Berenices	1670	12 36 5	- 0 50.8	84.9	$3\frac{1}{2}$ $3\frac{1}{2}$	336 –	5.3 +
67		1678	12 39 58	+14 58.2	80.3	$6\frac{1}{2}$ $7\frac{1}{4}$	200-	32.4 +
68	35 Comæ Berenices	1687	12 47 53	+ 21 50.6	85.3	5 8	65+	I-I -?
69	a Comæ Berenices	1728	13 4 39	+18 6.6	82.9	5 5	192+	0.56+?
70	127 P.XIII Virginis	1757	13 28 40	+ 0 14.9	82.4	8 9	69+	2.3 +
71	25 Canum Venat	1768	13 32 34	+ 36 51.5	85.3	6 7	329-	0.89+
72	84 Virginis	1777	13 37 33	+ 4 5.8	86.4	6 8	231 + ?	3·4 ±?
73	1785 ∑ Boötis	1785	13 44 6	+ 27 31.9	804	71 8	215+	2.1 -
74	1819 ∑ Virginis	1819	14 9 48	+ 3 39.0	85.4	8 8	11-	1.4 +
75	1830 ∑ Boötis	1830	14 12 11	+ 57 11.1	85.4	81 9	286+	6.1 +
13		1000		1 57 11.1	00.4	2 9	200 1	0.1
76	70 P. XIV Libræ	1837	14 18 46	-11 10.1	79.4	7 81/2	311-	1.5 -?
77	α Centauri		14 32 7	-60 22.7	85.5	I 2	200	14.0
78	π Boötis	1864	14 35 33	+ 16 53.5	80.4	$3\frac{1}{2}$ 6	102+	5.9 -
79	1876 ∑ Libræ	1876	14 40 33	- 6 55.5	78.9	8 8	72	1.4
80	ε Boötis	1877	14 40 11	+ 27 32.2	85.4	3 6	328+	2.8 -
	. D. "				266	1 (1		12 13 13
81	E Boötis	1888	14 46 18	+ 19 33.6	86.6	$4\frac{1}{2}$ $6\frac{1}{2}$	259-	3,3 -
82	288 O∑ Boötis	[288]	14 48 14	+ 16 10.0	84.4	6 7	195 -	1.4 +
83	i (44) Boötis	1909	15 0 11	+48 5.0	85.6	5 6	241+	5.0 +
84	I B Coronæ Bor	1932	15 13 37	+ 27 13.6	80.4	$6 6\frac{1}{2}$	302+	0.90-
85	η Coronæ Bor	1937	15 18 39	+ 30 41.4	86.6	5 6	179+	0.57 +
86	μ² Boötis	1938	15 20 22	+ 37 44.0	86.8	7 8	106-	0.70+
87	δ Serpentis	1954	15 29 33	+ 10 54.5	86.5	3 5	190-	3.5 +
88	298 O∑ Boötis	[298]	15 31 3	+40 10.8	86.7	7 8	105+	0.29+
89	γ Coronæ Bor	1967	15 38 7	+ 26 38.7	86.7	4 61	160-	0.93+
90	£ Scorpii (51 Libræ)	1998	15 58 19	-11 4.1	83.6	$4\frac{1}{2}$ 5	194+	1.14+
90	(cospi (gr zante)	1990	-3 30 19	4'1		12 3	77	
91	49 Serpentis	2021	16 8 10	+ 13 49.8	84.5	7 71/2	329+	3.9 +
92	2026 ∑ Herculis	2026	16 9 24	+ 7 38.5	71.5	$8\frac{1}{2}$ $9\frac{1}{2}$	325±?	I·4 ±?
93	σ Coronæ Bor	2032	16 10 34	+ 34 8.2	85.7	$6 6\frac{1}{2}$	207 +	4·I +
TE.	RECEIPTED RESERVED	DECEMBER 1	-	2003				

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No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
		Marie Par	h. m. s.	0 ,			0	"
94	λ Ophiuchi	2055	16 25 22	+ 2 13.6	86.6	4 6	44+	1.57+
95	ζ Herculis	2084	16 37 8	+ 31 48.2	86.7	3 7	90-	1.78+
,	0.11	A Same						06
96	21 Ophiuchi	[315]	16 45 50	+ 1 24.4	84.4	6 8	162-	0.86-
97	2106 \S Ophiuchi	2106	16 45 52	+ 9 35.9	84.5	6 8	311 -	0.59-?
98	167 B Herculis	2107	16 47 29	+ 28 50.7	85.5	$7 8\frac{1}{2}$	236 +	0.78 ± ?
99	uchi }	2114	16 57 41	+ 8 36.7	84.5	$6\frac{1}{2}$ $7\frac{1}{2}$	157+	1.27 + ?
100	210 B Hercalis	2120	17 0 24	+ 28 14.5	87.8	6 9	247-	5.9 +
	D				0			
101	μ Draconis	2130	17 3 3	+ 54 37.1	83.4	4 42	343 -	2.4 -
102	36 Ophiuchi	•••	17 8 34	-26 25 3	79.9	41 61		307124
103	δ Herculis	3127	17 10 31	+ 24 58.3	83.5	4 8½	184+	17.0-
104	ρ Herculis	2161	17 19 53	+ 37 14.9	83.6	4 5	311+	3.9 +
105	221 B Ophiuchi	2173	17 24 44	- 0 58.3	84.5	6 7	17+?	0.39 - ?
106	μ¹ Herculis BC		TE 10 TO		00.	10 11		2061
		2220	17 42 10	+ 27 47.7	80.4		245+	0 96 +
107	0 1: 1:	[338]	17 46 58	+ 15 20.7	84.5	61 63	19-	0.8 +?
108	τ Ophiuchi	2262	17 57 5	- 8 10.7	86.6	5 6	256+	
109	70 Ophiuchi	2272	17 59 53	+ 2 32.5	86.6		13-	2.0 -
110	ε¹ Lyræ	2382	18 40 41	+ 39 33.2	86.8	5 6	15-	3.3 -3
111	ε² Lyræ	2383	18 40 41	+ 39 29.0	86.8	5 5	134-	2·4 ±?
112	2402 ∑ Serpentis	2402	18 43 33	+10 32.6	84.5	8 81	204+	1.08+
113	∫274 P. XVIII. \		18 57 5	- 0 51.9	80.6	9 101	63-	1.46-
114	Aquil. BC γ Coronæ Aust	2434	18 59 0	-37 12.9	83.6	6 6		1.62 + ?
115	W 37 1	2455	19 2 12	+22 0.1	83.6		37 ± ?	
113	2455 2 Vuipec	2455	19 2 12	122 0.1	03.0	$7\frac{1}{2}$ $9\frac{1}{2}$	95-	3·4 ± ?
116	108P.XIX.Draconis	2509	19 15 47	+63 0.5	79.7	61 8	342-9	0.94 + ?
117	δ Cygni	2579	19 41 31	+44 51.7	85.9	3 8	319-	1.84-?
118	400 O∑ Cygni	[400]	20 6 29	+43 38.3	74.5	71 81	107 —	round.
119	2696 ∑ Delphini	2696	20 28 3	+ 5 3.9	86.7	8 81	309	0.8
120	β Delphini	β 151	20 32 23	+14 12.8	83.5	4 5	182 +	0·23 ± ?
SIG		3-	0-3		30			
121	λ Cygni	[413]	20 43 7	+ 36 5.1	83.5	5 6	80-	0.65 ± ?
122	4 Aquarii	2729	20 45 35	- 6 2.3	79.7	6 7	167+	0.56+?
123	ε Equulei AB	2737	20 53 35	+ 3 52.5	86.2	6 6	284-	0.97 + ?
124	611 Cygni	2758	21 1 57	+ 38 12.5	83.8	5 6	119+	20.4+
125	2760 ∑ Cygni	2760	21 2 17	+ 33 41.1	86.7	7 8	225±?	8.0-
		Sec. (35)	W. S. C. C.			1		Name of the last

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No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
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126	δ Equulei AB	[535]	21 9 7	+ 9 33.9	86.9	4 41	203-	.0.47 -
127	2778 ∑ Aquarii	2778	21 9 59	- 1 41.4	80.7	8 9	271+	19.9 -
128	20 B Pegasi	2799	21 23 31	+10 36.5	86.7	7 7	306-	I.4 +?
129	29 B Pegasi	2804	21 27 52	+ 20 13.6	83.7	$7\frac{1}{2}$ 8	328+	2.8 +?
130	μ Cygni	2822	21 39 12	+ 28 15.0	85.6	4 5	119+	3.2 -
131	E Cephei	2863	22 0 35	+64 5.4	85.7	5 6	284-	6.5 +
132	ζ Aquarii	2909	22 23 9	- 0 35.0	83.6	$4 4\frac{1}{2}$	330-	3.2 -
133	2934 ∑ Pegasi	2934	22 36 32	+ 20 51.6	84.2	$7\frac{1}{2}$ 9	157-	1.1 -
134	π Cephei	[489]	23 4 23	+74 47.6	80.5	5 10	25+	1.10-
135	o Cephei	3001	23 14 4	+67 30.5	83.3	5 8	191+	2.8 +
136	69P.XXIII.Aquarii	3008	23 18 4	- 9 3.8	80.9	8 81	255-	4.6 -
137	85 Pegasi		23 56 23		81.5	6 12	311+	0.58-
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			F 201 211					

PART II.—SUSPECTED BINARY STARS.

This list must be regarded as being just a little more than what the above title would indicate, for it includes various pairs which are in motion in a rectilinear direction, and also some objects of which no recent measures seem to exist, or, at any rate, to have been published. In other words, taken as a whole, it may be said to be intended to suggest to astronomers work which needs to be done.

The arrangement of the columns is the same as in Part I., and the introductory remarks made there apply, as a rule, here.

No.	Name of Star.	Σ,	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
-			h. m. s.	0 /			0	"
1	4 OΣ Andromedæ	[4]	0 10 57	+ 35 51.0	80.5	7 8	163 -	0.4 -
2	1968 h Ceti		0 22 4	-17 1.1	80.7	7 10	73 + ?	7.0 -
3	44 \(\Sigma\) Andromedæ	44	0 32 27	+40 22.9	85.8	81 9	264 + ?	9.4 +
4	ϕ Andromedæ	[515]	I 3 5	+ 46 39.5	83.8	4 61/2	260-	0·25 ± ?
5	ζ Piscium	100	1 7 59	+ 6 43.7	84.0	6 8	63	23.5
6	ψ Cassiopeiæ BC	117	1 18 10	+67 33.3	72.6	9 11	253	2.7 -?
7	100 Piscium	136	1 29 1	+11 59.8	65.4	7 8	78	15.8
8	162 \(\Sigma\) Androm. AB	162	I 42 25	+47 21.2	83.8	$6\frac{1}{2}$ $7\frac{1}{2}$	217-	1.8 -?
9	γ Arietis	180	1 47 29	+ 18 45.3	83.8	41/2 5	358+	8.4 -
10	10 Arietis	208	I 57 23	+ 25 24.3	83.8	6 81/2	50+	1.04-
11	234 ∑ Cassiopeiæ	234	2 9 16	+60 51.1	71.2	8 81	220-	0.6 -
12	40 O∑ Trianguli	[40]	2 14 59	+ 37 59.8	83.9	7 8	51-	0.5 +?
13	285 ∑ Trianguli	285	2 32 1	+ 32 57.0	83.8	$7 7\frac{1}{2}$	171	1.8
14	43 O∑ Arietis	[43]	2 34 14	+ 26 8.8	83.9	7 9	52-	0.9 +
15	84 Ceti	295	2 35 35	- 1 9.8	64.9	6 12	325 —	4.6 ±?
16	θ Persei AB	296	2 26 17		90.7		200 (16.
		100000	2 36 41	+ 48 45.8	80.1	4 10	299 +	16.5 ±
17	γ Ceti	299	2 37 36	+ 2 33.5	83.9	3 6	289+	2·9 ±?
18	85 B Persei	314	2 45 2	+ 52 32.2	80.0	$7\frac{1}{2}$ 8	302+	1.4 ± ?
19	326 ∑ Arietis	326	2 49 6	+ 26 26.0	83.9	7 9	217±?	8.2 —
20	360 ∑ Persei	360	3 5 10	+ 36 48.1	83.9	$7\frac{1}{2}$ 8	139-	1.9 +

Chap. XIII.] A Catalogue of Suspected Binary Stars, 325

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No.	Name of Star.	Σ.	R.	Α. 1	890.	Decl.	1890.	Epoch 1800+	I	Mag.	Position.	Dista	nce.
			h.	m,	s.	0	,				0	"	5.7
21	I P. III. Cassiopeiæ	[52]	3	7	56	+65	15.0	74·I	61/2	7	139-	elong	. <u>+</u>
22	367 ∑ Ceti	367	3	8	23	+ 0	19.8	77.0	8	8	245-	0.5	-
23	53 O∑ Persei	[53]	3	10	31	+ 38	13.7	83.9	7	8	252-	0.6	+?
24	400 ∑ Camelopardi	400	3	26	20	+ 59	39.6	79.5	71/2	81/2	301 +	0.7	
25	672 h Eridani	407	3	24	47	-11	30.3	79.0	8	9	48+	2.2	-?
								0					
26	476 ∑ Persei	476		54		1 31	21.7	80.4	71/2	81/2	285+	19.9	150
27	493 ∑ Tauri	493	4		53		24.2	80.0	8	81	92-	1.4	
28	497 ∑ Tauri	497	4		35	+ 8	9.0	78.9	8	9	232-	13.3	-
29	40 Eridani BC	518	-	10		- 1	46.7	83.0	9	11	119 -		7
30	520 ∑ Tauri	520	4	11	41	+ 22	32.9	83.9	8	81/4	109+	0.8	±
31	547 ∑ Eridani	547		20	21	_ T	38.3	81.8	9	12	15+	2.4	
32	80 Tauri	554		23			23.9	79.0	6	81	7-	0.5	
33	4 B Aurigæ	572		31			43.8	84.0	61	61	203-	3.5	
34	589 ∑ Orionis	589		38		+ 5	5.2	63.7	8	8	303-	4.4	± .
35	258 P. IV. Orionis	622		52	23	+ 1	30.3	80.0	81/3	9	354-	2.4	+ ?
20	=3-2-1-02101115		4	54	40		30.3	18/11	2	9	304		
36	619 ∑ Aurigæ	619	4	52	52	+ 50	6.1	71.6	8	8	115+	5.0	-
37	288 P. IV. Orionis	[95]	4	58	9	+ 9	38.6	84.0	7	7	336-3	0.8	+
38	269 P. IV. Camelop.	634	5		26	+79	6.1	78.3	51/2	9	2 +	20.2	-
39	676 ∑ Camelopardi	676	5	13	53	+64	38.5	72.6	$7\frac{1}{2}$	$8\frac{1}{2}$	274-	1.0	+
40	677 ∑ Camelopardi	677	5	14	26	+63	16.4	74.1	$7\frac{1}{2}$	8	261-	1.7	+ 3
41	749 ∑ Tauri	749	5	30	16	+ 26	51.5	83.7	$7\frac{1}{2}$	8	177±?	1.0	+
42	β 89 Orionis		5	51		- I		79.6	8	9	1+	0.7	± ?
43	112 O∑ Aurigæ	[112]	5	32	20		53.8	85.0	7	7	74-	c.7	-
44	COrionis	774		35	12	- 2	0.2	83.0	3	.61	155+	2.6	± ?
45	3115 Z Camelopardi	3115	5	38	0	+62	44.2	83.5	7	8	23-	1.5	+ 3
.6	52 Orionis	F-0.7		4.2	6	. 6	2	he v	6	61	202 2	EDX E	
46		795		42	6		25.0	77.1	6	$6\frac{1}{2}$	203 ± ?	1.4	
47	840 \(\Sigma\) Orionis BC 4 Lyncis	840 881	6		22	7000	46.0	79.0	6	9	174-	0.7	3
48	4 Lyncis 143 O∑ Geminorum			12		+ 59		83.8		71	101 +	0.9	+ 3
49	143 OZ Geminorum 149 O∑ Geminorum	[143]	-	24		+ 17	1.2	84.0	7	10	101-	8.1	+
50	149 02 Geninorum	[149]	0	29	35	+ 27	22.8	84.1	6	9	296—	0.5	±
51	15 Monocerotis	950	6	34	55	+ 9	59.8	82.6	61	9	211 + ?	3.0	+?
52	156 O∑ Geminorum	[156]		40		+18	-	84.0	61	7	310-	0.6	
		[]-]			01		-		2				

No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
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53	14 Lyncis	963	h. m. s. 6 43 23	+ 59 37.6	82.8	6 6	66+	0.5 -
54	52 P.VII. Can. Min.	[170]	7 11 36	+ 9 30.1	83.4	7 7	113-	1.5 +?
55	δ Geminorum	1066	7 13 33	+ 22 11.3	83.3	$3\frac{1}{2}$ 9	205+	7.0 +?
			Self-Williams					
56	1074 \(\Sigma\) Monocerotis	1074	7 14 52	+ 0 36.8	78.5	74 8	135+	0.6 +
57	1081 ∑ Geminorum	1081	7 17 36	+ 21 40.6	77.2	$7\frac{1}{2}$ $8\frac{1}{2}$	223+	I·4 ±?
58	1093 \(\text{Lyncis} \)	1093	7 21 55	+ 50 12.4	78.8	8 8	130+	0.07 - ?
59	1104 \(\Sigma\) Puppis	1104	7 24 22	-14 45.1	82.8	7 9	320+	2·7 ±?
60	175 O∑ Geminorum	[175]	7 28 9	+ 31 10.8	84.0	$6 6\frac{1}{2}$	332 ±	0.7 +
61	170P.VII.Can.Min.	1126	7 34 17	+ 5 29.1	84.4	7 8	138-	1.4 +?
62	177 OZ Lyncis	[177]	7 34 42	+ 37 42.3	84.0	7 8	127-	0.6 +?
63	κ Geminorum	[179]	7 37 48	+ 24 39.7	84.0	4 81/2	235+	6.5 ±?
64	182 OE Can. Min.	[182]	7 46 56	+ 3 40.3	85.1	7 74	34-	I.I ±?
65	187 O∑ Cancri	[187]	7 57 12	+ 33 21.5	84.2	61 71	277-	0.3 + ?
66	13 P. VIII. Cancri	1202	8 7 32	+11 11.0	83.5	71 10	227	2.5 +?
67	10		8 7 32	+ 24 53.8	80.2	$\begin{array}{c c} 7\overline{2} & 10 \\ \hline 7 & 7\frac{1}{2} \end{array}$	321 -	2.5 +?
68	υ Caneri	1224	8 47 32	+ 30 59.8	84.1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	42 + 328 -	1.4 +?
69	Ursæ Majoris	[196]	8 51 41	+48 28.4	83.4	3 1 11	356+	9.5 -
70	σ² Ursæ Majoris	1306	9 0 44	+67 35.0	82.8	$5\frac{1}{2}$ $9\frac{1}{2}$	238-	2.6 -?
1		1300	9 - 44	107 33	02.0	32 92	230	
71	1316 ∑ Hydræ AB	1316	9 2 25	- 6 41.1	73.2	7 1112	139+	6.7 ±?
72	38 Lyncis	1334	9 12 0	+ 37 16.3	84.1	4 7	236-	2·9 ±?
73	201 OΣ Leonis	[201]	9 17 25	+ 28 22.0	85.1	72 9	222-	1·3 ±?
74	21 Ursæ Majoris	1346	9 17 51	+ 54 29.3	74.2	8 9	312+	5.3 -
75	116 B Hydræ	1348	9 18 41	+ 6 49.9	8.t.1	$7 7\frac{1}{2}$	327-	1.7 +
76	1355 ∑ Hydræ	1355	9 21 30	+ 6 42.8	84.1	7 74	333+	2.6 -?
77	1423 ∑ Leonis	1423	10 13 10	+21 7.2	6:.2	81 9	76-	I.2 +?
78	49 Leonis	1450	10 29 16	+ 9 13.1	84.1	6 81	157-	2·3 ± ?
79	128 P. X. Leonis	[224]	10 33 56	+ 9 24.5	84.2	7 9	326-	0.5 +
80	227 OΣ Leonis	[227]	10 35 53	+11 18.4	84.2	7 8	341+	0.6 + ?
					0.0	1 01	0.0	
81	1472 \(\Sigma\) Leonis	[472	10 41 11	+ 13 .33.2	85.8	$7\frac{1}{2}$ $8\frac{1}{2}$	38 ± ?	36.9 +
82	2290 O∑ Ursæ Maj.	[229]	10 43 40	+41 41.2	84.2	$6\frac{1}{2}$ 7	330-	0.8 +
83	158 Russell Carinæ		10 45	-58 38	80.2	7 8	258+	I·I +
84	54 Leonis 1500 Σ Leonis	1487	10 49 39	+ 25 20.2	84.2	5 72	105+	6.3 -?
85	1500 2 Leonis	1500	10 54 25	- 2 53.1	85.8	$ 7\frac{1}{2} 8$	312-	1.5 +

								Epoch					
No.	Name of Star.	Σ.	R.	A. 18	390.	Decl.	1890.	1800+.	N	Iag.	Position.	Distan	ce.
			b.	m.	p.	0	,				0	"	
86	229 P. X. Leonis	1504	1	58			13.8	84.2	71/2	71/2	285+	1.2	+ ?
87	9 P. XI. Leonis	1517	11	7	56	+ 20	.44.0	84.2	71/2	$7\frac{1}{2}$	100-	0.5	_
88	339 B Leonis	1527	11	13	14	+ 14	52.4	84.2	7	81/2	14+	3.6 -	— ?
89	4737 Lac. Carinæ		11	18	36	-64	21.3	71.4	6	7	292+?	2.5	+ ?
90	57 Ursæ Majoris	1543	11	23	9	+ 39	56.5	84.2	5	8	4-	5.6	+ ?
91	88 Leonis	1547	II	26	5	+ 14	58-8	84.2	61	81	323+	15.5	+
92	90 Leonis	1552	11		59		24.4	84.2	61	$7\frac{1}{2}$	209-?	1000	
93	III P.XI.Ursæ Maj.	1555		30			23.5	84.2	6	$6\frac{1}{2}$	346+	0.6	
95	2410\(\Surse Majoris	[241]	II	50		+ 36	2.0	84.2	61/2	81	125+	1.5	122
95	187 Russell Crucis	r-4-7	12	4	-0	-60		80.4	9	10	209-	3.8 -	2000
95				7		91.55		12.11	9	10	209		
96	1606 ∑ Can. Venat.	1606	12	5	14	+ 40	30.0	84.2	6	7	338-	1.2 -	+ ?
97	68B.ComæBerenices	1639	12	18	55	+ 26	12.0	84.1	61	8	245 -	0.3 -	-?
98	245 O\(\Sigma\) Com\(\pi\) Beren.	[245]	12	12	0	+ 29	32.0	84.2	6	10	278+	8.3	+ ?
99	1643 ∑ Comæ Beren.	1643	12	21	43	+ 27	39.0	73.2	8	81	50-	1.8	<u>+</u> ?
100	191 B Virginis	1647	12	24	59	+ 10	20.0	85.3	71/2	8	217+	1.4 -	+
							SUSSES.						2
IOI	1663 ∑ Comæ Beren.	1663	12	31	42	1	48.0	85.3	71/2	9	107-	0.7 -	
102	209Russell Centauri		13	0		-59	770 N D	80.4	8	8	25 —	0.7 -	316
103	2610\(\Sigma\) Canum Venat.	[261]	13		49	+ 32	CCOV.	84.3	7	74	348-	1.4 -	
104	1734 ∑ Virginis	1734	13		6	+ 3		85.3	7	8	191-	1.0	
105	266 O∑ Virginis	[266]	13	23	2	+10	18.2	84.3	7	8	339+	1.6 -	+
106	ı Boötis	1772	13	2=	25	+ 20	30.6	86.3	6		142-	4.8 -	_ 2
107	1781 \(\Sigma\) Virginis	1781	1000	40		+ 5		85.9	7	9	264+	0 515	-
107	τ Boötis	[270]	13		4		59.8	84.3	5	II	353+	9.0 -	
100	238P.XIII.Virginis	1788		49	U.E	- 7		85.4	7	81	72+	2.5 -	
110	274 O∑ Boötis	[274]	14	3	56		17.6	84.3	7	9	66+	14.1 -	46
110		[-/4]	7		30	. 3.		OT J	1	9	00 1	17.	
111	1808 ∑ Boötis	1808	14	5	11	+ 27	7.8	85.4	8	9	73+	2.7 ±	+ ?
112	277 OΣ Boötis	[277]	14	7	32	+ 29	13.9	84.3	73	8	354+	0.5	
113	1820 ∑ Boötis	1820	14	9	25	+ 55	50.0	85.	8	81	67+	2.1 -	-
114	121 B Boötis	1825	14	11	27	+ 20	38.1	85.3	7	9	176-	3.9 -	- ?
115	1863 ∑ Boötis	1863	14	34	21	+ 52	3.2	83.7	7	7	98-	0.6	+ ?
19.		132					No.	La Villa			1410		
116	ζ Boötis	1865		35	53	+14		86.4	$\frac{1}{2}$	4	113-	0.5 -	-
117	260 B Boötis	1867	14	36	4	+ 31	46.3	75.9	8	81	16-	1.3 -	- 5

No.	Name of Star.	Σ	R.A. 1890.	Decl. 1890.	Epoch	Mag.	Position.	Distance.
210.				200. 2090.	1800+.		2 052020	Distance.
			h. m. s.	0 /			0	"
118	1883 ∑ Boötis	1883	14 43 26	+ 6 24.7	85.4	$7 - 7\frac{1}{2}$	76 -	0.6 -
119	39 Boötis	1890	14 45 57	+49 10.3	85.4	5 6 6 5	43-?	3.1 -
120	1893 ∑ Boötis	1893	14 51 6	+ 29 55.2	79.3	8 81/2	247-	19.9 -
121	289 O∑ Boötis	[289]	14 51 21	+ 32 43.2	84.3	6 10	113-	4.7 + ?
122	18 Libræ	1894	14 52 57	-10 42.0	83.2	7 10	39-	19.8 +
123	342 B Boötis	1901	14 56 23	+ 31 48.5	79.3	71/2 9	199-	27.1 -
124	279 P. XIV. Boötis	1910	15 2 14	+ 9 38.9	86.5	7 7	210+	4.3 -?
125	1934 ∑ Boötis	1934	15 13 32	+44 11.6	85.9	8 8	31 -	6.7 +
	7.0 D			The Wil	-	The first of	Say Lo	
126	1941 ∑ Coronæ Bor.	1941	15 21 2	+ 27 1.0	80.3	8 8	227-3	1.3 -?
127	1944 \(\Serpentis\)	1944	15 22 17	+ 6 29.1	85.4	7 8	331 -	1·3 ±?
128	296 OX Boötis	[296]	15 22 31	+ 44 24.2	84.4	7 81	212 —	1.7 -?
129	1957 ∑ Serpentis	1957	15 30 41	+ 13 16.9	76.4	8 9	156-	1.5 ± ?
130	1985 ∑ Serpentis	1995	15 50 13	- I 50·0	85.4	$6\frac{1}{2}$ $8\frac{1}{2}$	334+	5.9 +
131	1993 ∑ Serpentis	1993	15 54 48	+ 17 41	86.5	8 8	38 ±	30.0 -
132	2006 Draconis AB.	2005	15 58 12	+ 59 14.8	79.2	8 9	193-	1.7 +
133	$\begin{cases} \nu \text{ Scorpii AB.} (=) \\ \beta \text{ 120} \end{cases}$		16 5 36	-19 10.3	80.6	4 7	10+	0.7 ±?
134	306 O∑ Coronæ Bor.	[306]	16 7 39	+ 34 41.4	84.3	7 9	42 -	0.38-?
135	2022 ∑ Coronæ Bor.	2022	16 8 18	+ 26 57.4	85.4	6 9	135+	2.6 -?
136	a Scorpii A a		16 22 39	- 26 11.2	79.5	1 7	271 —	3.0 - ?
137	2049 ∑ Coronæ Bor.	2049	16 23 23	+ 26 13.7	84.5	61 71	210-	1·2 ± ?
138	2080 ∑ Herculis	2080	16 34 47	+ 38 32-7	79.2	8 12	25-	3.5 -
139	313 O∑ Herculis	[313]	16 28 55	+40 20.1	83.5	7 8	151-	1.0 +
140	3107 ∑ Ophiuchi	3107	16 53 17	+ 4 6.0	78.9	81 81	100-	1.33-
T				F 750	THE STATE OF		44.6	A THE STATE OF
141	20 Draconis	2118	16 55 52	+65 12.4	83.4	$7 7\frac{1}{2}$	round-	round ± ?
142	a Herculis	2140	17 9 38	+ 14 30.1	84.5	$3\frac{1}{2}$ $5\frac{1}{2}$	114-	4·7 ± ?
143	ρ Herculis	2161	17 19 53	+ 37 14-3	84.5	$4^{\frac{1}{2}}$ $5^{\frac{1}{2}}$	311+	3.9 ± !
144	281 B Herculis	2165	17 21 58	+ 29 32.5	79.7	71 81	53	7.6
145	135P.XVII.Ophiue.	[331]	17 26 38	+ 2 54.9	84.4	$7 8\frac{1}{2}$	337 +	1.1 +
146	2199 ∑ Draconis	2199	17 36 35	+ 55 48.9	83.8	7 8	98-	1.9 ±?
147	2218 ∑ Draconis	2218	17 39 36	+ 63 43.2	74.5	7 81	350+	2·1 <u>+</u> !
148	μ Herculis	2220 BC	17 42 10	+ 27 47.7	83.9	10 11	80+	0.6 —
149	260 P. XVII	[337]	17 45 18	+ 7 16.5	84.6	7 8	292-	0.5 +?
150	401 B Herculis	2277	18 0 16	+ 48 28.0	66.7	61/2 9	119+	27·1 ±?
		Epilly English		- Indiana	1			IS NEW

Chap. XIII.] A Catalogue of Suspected Binary Stars. 329

-	No.	Name of Star.	Σ.	R.A. 1890.	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
		1 m1 ···		h. m. s.	0 ,	0		0	"
ı	151	5027 h Telescopii		18 4 39	-54 25	81.7	9 10	91+	11.4 -
ı	152	73 Ophiuchi	2281	18 4 6	+ 3 58.4	83.0	5 7 7 8	249-	1.08 — ?
ı	153	DII.	2283			83.6		84	1.0
ı	155	DG GI	2303	18 5 14	+ 16 27.3 - 8 1.0	The state of the	6 7 7 10	233-	1·5 + 2·6 —?
ı	* 55	15 B Scuti Sob	2303	16 14 0	- 8 1.9	79.0	, 10	222+	2.0 -!
1	156	452 B Herculis	2315	18 20 35	+ 27 19.6	83.9	7 8	244-	0.26-
ı	157	354 O∑ Serpentis	[354]	18 26 40	+ 6 42.0	84.5	7 8	166+	0.9 +?
ı	158	55 Tauri Poniat	2342	18 30 11	+ 4 53.5	76.6	6 9	9 -	28.7 +
ı	159	358 O∑ Herculis	[358]	18 30 59	+ 16 54.5	83.9	7 7	198-	1.8 +
ı	160	2360 Σ Herculis	2360	18 34 37	+ 20 49.8	84.5	7 8	0-	2.5
I									
ı	161	2369 ∑ Aquilæ	2369	18 38 24	+ 2 31.1	84.5	71/2 8	93-?	1.1
ı	162	2384 ∑ Draconis	2384	18 38 53	+67 1.3	0	8 9		EXC POL
ı	163	o Draconis	2420	18 49 34	+ 59 15.3	83.4	5 9	337-	31.4 + ?
ı	164	2422 Herculis	2422	18 52 39	+ 25 57.3	85.5	71/2 71/2	96-	0.8 +?
ı	165	11 Aquilæ	2424	18 54 2	+13 28.8	83.2	7 10	260+	17.0 -
ı	166	2437 ∑ Sagittæ	2437	18 57 4	+19 0.7	75.6	$7\frac{1}{2}$ $7\frac{1}{2}$	70	1.0
ı	167	287P.XVIII.Draco.	2438	18 55 40	+58 4.4	79.5	7 8	single-	single
ı	168	2454 ∑ Lyræ	2454	19 1 53	+30 16.1	83.4	71 81	243+	0.8 ±?
ı	169	17 Lyræ	2461	19 3 16	+ 32 19.7	84.6	6 10	317-	3·8 ±?
ı	170	6 B Cygni	2486	19 9 16	+49 37.9	79.9	61 7	220-	9.8 -
ı									
ı	171	371 O∑ Lyræ	[371]	19 11 32	+ 27 14.9	84.6	61/2 7	156+	0.8 ±
ı	172	108P.XIX.Draconis	2509	19 15 47	+63 0.5	84.5	8 9	337 -	I·I +
ı	173	128 P. XIX. Anseris	2521	19 21 40	+19 40.4	64.6	6 10	41 -	23.7 ±?
ı	174	22 B Cygni	2525	19 22 4	+ 27 5.8	83.2	7 74	227-	0.23-
ı	175	375 O∑ Sagittæ	[375]	19 29 43	+ 17 52.4	86.5	$7\frac{1}{2}$ $8\frac{1}{2}$	145+	0·7 ±?
ı	176	185 P. XIX. Antinoï	27.47	6	10 10 1	96 -	8 10		
ı	-	2544 ∑ Aquilæ AB	2541	19 30 46	-10 40.5	86.7		332-	40 +?
ı	177	2556 ≥ Vulpeculæ	2544	19 31 48	+ 8 3.6	76.3	$7 9\frac{1}{2}$	210-	1.4 -
ш	179	2576 ∑ Cygni	2556 2576	19 35 43	+21 59.8	83.5	7 7 8 8	155-	0-4 -?
	180	17 Cygni	2580	19 41 23	+33 21.4 +33 28.8	83.6	5 9	71-	3.0 - 25.8 +?
1		-1038	-500	-9 42 15	33 20.0	3.0	3 9		25.0 T :
1	181	307 P. XIX. Aquilæ	2590	19 47 1	+10 4.1	70.6	7 11	309+	13.4 +
1	182	€ Draconis	2603	19 48 32	+69 59.2	78.8	$5\frac{1}{2}$ $9\frac{1}{2}$	I +	2.8 ±?
L							EC .		to the

				1				
No.	Name of Star.	Σ.	R.A. 1890	Decl. 1890.	Epoch 1800+.	Mag.	Position.	Distance.
1.31			h. m. s	0 /			0	"
183	191 B Aquilæ	2597	19 49 2	7 0.9	80.7	71/2 8	88 ±?	1.2 -?
184	116 B Cygni	2607	19 54 1	+ 41 57.5	79.6	8 9	311-	0.36 -
185	393 OZ Cygni	[393]	19 54 2	+ 44 5.4	86.5	7 8	226+?	20.6 -
186	16 Vulpeculæ	[395]	19 57 2	+ 24 37.6	86.5	6 6	96+	c.7 +
187	396 P. XIX. Capric.	2625	20 0 3	3 -13 14.5	66.3	8 12	12	12.8
188	2640 ∑ Draconis	2640	20 3 2		83.5	6 10	21-	5.2 -
189	$\left\{ \begin{array}{c} \theta \text{ Sagittæ AB} \\ \dots \text{ AC} \end{array} \right\}$	2637	20 5	+ 20 35.2	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	7 9 8	326-? 225-?	11.5 ±?
700	178 P. XX. Del-1	2690	20 25 5		83.4	$\begin{bmatrix} 7 & 8 \\ \frac{1}{2} & 7^{\frac{1}{2}} \end{bmatrix}$	31-	0.4 -
190	} phini BC ∫	2090	25 25 5	7 10 55.4	03.4	12 12	31-	0.4 -
191	94 Vulpeculæ	2695	20 27 1	5 + 25 25.9	84.2	61 81	81+	1.4 +
192	κ Delphini	[533]	20 33 4	6 + 9 42.2	81.4	12	324-	11-2 +
193	2708 ∑ Cygni	2708	20 34 3	+ 38 15.4	83.8	7 81/2	333 -	23.5 +
194	2725 ∑ Delphini	2725	20 41	4 + 15 30.2	86.7	7 8	2 —	5.2 + ?
195	418 O∑ Cygni	[418]	20 50 1	8 + 32 17.4	83.7	7 7	109-	I.O +
196	ε Equulei	2737	20 53 3	5 + 3 52.5	84.5	5 6	286 —	1.2 +
197	429 P. XX. Cygni	2741	20 54 5	8 + 50 2.0	79.7	6 71	31-	1.9 -
198	λ Equulei	2742	20 56 4	7 + 6 44.8	86.2	6 61	222 -	2.8 ±?
199	2744 ∑ Aquarii	2744	20 57 2	9 + 1 5.9	86.7	61 71	170-	1.6 ±?
200	2746 ∑ Cygni	2746	20 57 3	6 + 38 49.9	83.6	71/2 81/2	290 +	I.O ±?
201	431 O∑ Cygui	[431]	21 7 2	2 + 40 49.5	86.7	$7\frac{1}{2}$ $7\frac{3}{4}$	120+	3·1 ±?
202	50 P. XXI. Cygni	[432]	21 10	5 + 40 41.6		7 74	127-	1.4 +?
203	τ Cygni		21 10 2		79.5	51 8	148-	0.9 -
204	437 O∑ Cygni	[437]	21 16 1	1 + 31 59.0	83.7	6 7	49-	1.5 +?
205	2790 ∑ Cephei	2790	21 16 1	3 + 58 9.1	64.5	6 10	45	4.4
206	29 B Pegasi	2804	21 27 5	4 + 20 13.6	83.7	71 8	328+	2.8 +?
207	448 O∑ Cygni	[448]	21 36	7 + 28 50.1		8 81		0.8 ±
208	2825 Aquarii	2825	21 41 1			8 81	235-	1.2 ±?
209	2847 ∑ Aquarii	2847	21 52 2		00	$\frac{7\frac{1}{2}}{8}$	305+	I·I -
210	41 Aquarii		22 8 1		No.	6 81		5·I ±?
		0.			188	25		
211	33 P. XXII. Pegasi	14.5	22 9	1 + 16 38.9		7 10	354+	10.4 +
212	33 Pegasi AB	2900	22 18 2		1000	6 9	179-	2.0 -
213	37 Pegasi	2912	22 24 2			6 75	131+	c·3 ± ?
214	2928 \(\Sigma\) Aquarii	2928	22 33 4	C. LOS COLGO		8 84		4.4 -
215	200P.XXII.Aquarii	2935	22 37 1	7 - 8 53-2	66.0	7 8 1	311-	2.5 -
					-	-	-	And the second second

Chap. XIII.] A Catalogue of Suspected Binary Stars. 331

T					5711								
1	No.	Name of Star.	Σ.	R.,	A. 18	190.	Decl.	1890.	Epoch 1800+.	M	lag.	Position.	Distance.
-			140	h.	m.	8.	0	,				o	"
	16	209P.XXII.Aquarii	2939		39			13.4	66.4	8	II	62	10.8
2	17	71 Aquarii (219 P. XXII.)	2943	22	41	52	-14		77.8	6	9	115+	28.3 -
2	18	Aquar. AB	2944	22	42	io	- 4	47.8	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	7 7	7 ¹ / ₄	²⁵⁵ 138+	3·5 48·3 —
	19	241 B Cephei	2950	22	47	4	+61	7.0	83.7	6	$7\frac{1}{2}$	311-	2.2 +?
2	20	52 Pegasi	[483]	22	53	41	+11	8.1	83.7	5	10	211+	1.0 +
2	21	{2976\(\Sigma\)Piscium\(AB\)}, \(AC\)	2976	23	2	8	+ 6	0.3	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	8	10	263+	7.5 ±? 16.8 +
2	22	306 P.XXII. Pegasi	2978	23	2	12	+ 32	13.8	184.0	7	$\frac{9}{8\frac{1}{2}}$	189+	8.5 -?
2	23	3006 ∑ Pegasi	3006	23	15	52	+ 34	50.6	64.9	81/2	9	173-	4.9 ±?
	24	3009 ∑ Piscium	3009		18		+ 3	6.7	65.2	71/2	$9^{\frac{1}{2}}$	230	6.9
2	25	3046 ∑ Ceti	3046	23	50	40	-10	7.0	77.7	8	81	243+	3.0 +
2	26	37 Andromedæ	3050	23	53	53	+ 33	7.0	83.7	6	6	26+	3.0 -
2	27	3056 ∑ Andromedæ	3056	23	59	I	+ 33	39.0	83.7	7	7	151-	0.7 ±?
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CHAPTER XIV.

A CATALOGUE OF NEW STARS.

IN compiling the Catalogue of Uncalculated Comets (Book IV, ante), I found myself much embarrassed in consequence of the Chinese chroniclers having intermingled with their comets proper a number of objects specifically termed by them "new stars." In some cases it was tolerably clear from internal evidence that these "new stars" were veritable comets. but in others it was impossible to express a confident opinion. Some of these uncertain objects were added to the cometary list, and others were wholly passed over, without any definite rule being conformed to. This manifestly involved serious drawbacks, and on reflection, conceiving that it would be convenient to astronomers to possess a comprehensive catalogue of all recorded temporary stars, I determined to detach from the comets all objects which certainly were not comets and unite them with all objects which certainly were stars. The two lists, that is to say, this one and that in Book IV. Ch. VII. (ante). between them comprise, it is supposed, every comet of which an unequivocal record has been handed down to us. I cannot, however, assert that this list is equally exhaustive in regard to the temporary stars. Let it be understood, therefore, that whilst the Comet Catalogue probably contains no stars, this, most likely, does contain some comets.

I have not included objects which are commonly, and on sufficient authority, dealt with as Variable Stars and usually included in Variable Star Lists; such will be found elsewhere.

The references cited as "Biot" are to E. Biot's lists published in the *Connaissance des Temps* for 1846. The better known temporary stars are not dealt with at length, as they are described elsewhere in this volume. For the sake of completeness, however, it was necessary to mention them here.

133 B.C. In June or July an extraordinary star appeared near β , π , ρ Scorpii.— (Biot; Williams, Comets, p. 6.) Perhaps identical with the comet of 134; or this may have been the temporary star which attracted the attention of Hipparchus and led to the formation of his Catalogue.

76 B.C. In September—October an extraordinary star appeared between α and δ Ursæ Majoris.—(Biot; Williams, Comets, p. 7.)

101 A.D. On Dec. 30 a small yellowish-blue star appeared in the group $a, \gamma, \eta, \sigma, \kappa$ Leonis (Biot); as no mention is made of any change of position it may have been merely a temporary star.—(Hind, Companion to the Almanac, 1859, p. 12.)

107. On Sept. 13 a strange star appeared to the S.W. of δ , ϵ , η Canis Majoris.—
(Biot.)

123. In December—January an extraordinary star was seen in the region near a Herculis and a Ophiuchi.—(Biot.)

173. On Dec. 10 a star appeared between α and β Centauri, and remained visible 7 or 8 months; it was like a large bamboo mat, and displayed five different colours.

—(Biot.) Williams dates this object for Dec. 7, 185.—(Comets, p. 16.)

290. In May a strange star was observed within the Circumpolar regions.—Matuoan-lin; Williams, Comets, p. 26.)

304. In May—June a strange star was seen in the sidereal division of a Tauri.—
(Biot; Williams, Comets, p. 27.)

369. From the 2nd to the 7th Moon an extraordinary star was visible in the Western boundary of the circle of perpetual apparition. The 2nd Moon commenced about March 25, and the 7th about August 20.—(Biot; Williams, Comets, p. 29.)

386. Between April and July a strange star was seen in the sidereal division of λ , μ , ψ Sagittarii.—(Biot; Gaubil; Williams, Comets, p. 29.)

393. Between March and October a strange star appeared in the sidereal division of μ^2 Scorpii or in R.A. \pm 17^h.—(Biot.) Williams places this object in R.A. \pm 9½^h.—(Comets, p. 30.)

561. On Oct. 8 an extraordinary star was seen in the sidereal division of a Crateris.—(Biot; Williams, Comets, p. 36.)

577. Pontanus (Hist. Gelr. iii) dates the appearance of a comet in the year that the son of Chilperic died, consequently in 577. Pingré thinks that it is the object recorded by Gregory of Tours as having appeared in the middle of the Moon on Nov. II, during the celebration of the vigils of St. Martin, and probably a meteor.— (Comét. i. 323).

827 (?). The year is very doubtful. The Arabian astronomers, Haly and Ben Mohammed Albumazar, observed at Bagdad a star in Scorpio for 4 months. It was as bright as the Moon in its quarters.

829. In November an extraordinary star was seen in ζ , θ , o, π Canis Minoris.—(Biot; Williams, Comets, p. 46.)

945. A new star was seen near Cassiopeia.—(Cyprianus Leovitius, Judicium de Novâ Stellâ cited in Tycho Brahe's De Novâ Stellâ, anni 1572.) [There is no contemporary authority for this statement, and its authenticity seems open to great doubt, unless, as is very likely, the allusion is to the comet of 945.]

- 1011. On Feb. 8 an extraordinary star was seen near σ , τ , ζ , ψ Sagittarii.—(Biot.)
- 1012. From May to August (it would seem) a star was visible in *Aries*. It was of astonishing size and dazzled the eye. It varied in size, and sometimes it was not seen at all. It lasted 3 months.—(Hepidannus, *Annales*.)
- 1054. On July 4 an extraordinary star appeared to the S.E. of ζ Tauri. It disappeared at the end of the year.—(Biot.)
- 1139. In this year an extraordinary star appeared in the division of κ Virginis.—(Biot.)
- 1174±. An immense star shone by night and by day in the W. It was surrounded by numerous others all bright red in colour.—(Boethius, *Hist. Scot.* xiii.) No doubt a meteor.—(Pingré.)
- 1203. Between July 28 and August 6 an extraordinary star was seen in the S.E. in the division μ^2 Scorpii. The colour was bluish-white resembling that of Saturn.—(Biot.)
- 1245. A bright star appeared in Capricornus for 2 months. It was comparable to Venus, but was red like Mars.—(Albertus Stadensis; Klein, Handbuch der Fixsternhimmel, p. 102.)
- 1264. A new star was seen in the vicinity of Cepheus and Cassiopeia.—(Leovitius.) Klein considers that this and the preceding are identical, but the comments on Leovitius made, ante, under the year 945, seem to apply to this record also.
- 1572. In Nov. 1572 a new star became visible in Cassiopeia; it lasted till March 1574. [See p. 54, ante.]
- 1584. On July I a star appeared in the sidereal division of π Scorpii.—(Biot; Williams, Comets, p. 93.)
- 1604. A new star appeared in *Ophiuchus*; at one time it was as bright as *Venus*. It was first seen on October 10, 1604, and last seen about the middle of October 1605. Its known duration was therefore about 12 months; but inasmuch as it was lost in consequence of coming into conjunction with the Sun its real duration might have been 14 or 15 months. At any rate in March 1606 it had become invisible. [See p. 55, ante.]
- 1612. A new star appeared in Aquila.—(Riccioli, Quelle Fromordi Meteorologica, lib. iii. cap. 2, art. 7; Klein, Handbuch, vol. ii. p. 105.) Klein insinuates that this is identical with a new star dated by the Chinese for 1609.
 - 1621. On May 12 a reddish star was seen in the E.—(Williams, Comets, p. 94.)
- 1848, 1866, 1876. New stars appeared in each of these years, but as they are described at length elsewhere, no further reference to them need be made here. [See pp. 55, 56, ante.]
- 1885. On or about August 31 a new star burst forth in the great nebula in Andromeda. At its maximum brilliancy it was about mag. 6.—(Observatory, vol. viii, pp. 321, 330, &c. Oct. 1885.)



INDEX.

*** This Index is designed for use in connexion with the Table of Contents.

It is not complete by itself.

Algol, 45.
Andromeda, 125; nebula in, 73.
Antlia Pneumatica, 126.
Apparatus Sculptoris, 220.
Apus, 127.
Aquarius, 128; cluster in, 66.
Aquila, 129.
Ara, 131.
Argo, 132; great nebula in, 88; star η Argûs, 46, 103.
Aries, 140.
Auriga, 141.

Bible references to stars, 15. Boötes, 143.

Cæla Sculptoris, 144. Camelopardus, 145. Cancer, 146; cluster in, 61. Canes Venatici, 147; nebula in, 63. Canis Major, 148. Canis Minor, 149. Capricornus, 151. Cassiopeia, 152. Centaurus, 154; cluster in, 90. Central Sun hypothesis, 24. Cepheus, 156. Cetus, 158. Chamæleon, 160. Circinus, 160. Circulus Lacteus, 111. Clusters of stars, 58; Catalogue of, 261. Clypeus Sobieskii, 221; nebula in, 91. Coloured stars, 36. Columba, Noachi, 161. Coma Berenices, 162; as a group of stars, 61.

Constellations, list of, 114.
Cor Caroli, 147.
Corona Australis, 163.
Corona Borealis, 164.
Corvus, 165.
"Crab" nebula in Taurus, 85.
Crater, 166.
Crux, 167; cluster in, 89.
Cygnus, 168.

Delphinus, 171.
Dorado, 171; nebula in, 88.
Double stars, 28; Catalogue of, 256.
Draco, 172.
"Dumb-bell" nebula, 91.

Elliptic nebulæ, 73. Equuleus, 174. Eridanus, 175.

Fixed Stars, 1.
Fornax Chemica, 177.

Galaxy; see Milky Way. Gemini, 178. Grus, 180.

Harvard Photometry cited, 12, 120. Hercules, 181. Herschel, Sir J., remarks on stars, 18. Horologium, 183. "Horse-shoe" nebula, 91. Hyades in Taurus, 61. Hydra, 184. Hydrus, 186.

Indus, 44.

Lacerta, 187.
Leo, 188.
Leo Minor, 190.
Lepus, 190.
Libra, 191.
Lupus, 192.
Lynx, 194.
Lyra, 195; annular nebula in, 69.

Magellanic clouds, 94.

Magnitude of stars, 3; list of stars of the 1st magnitude, 3.

Microscopium, 197.

Milky Way, 105.

Monoceros, 197.

Mons Mensæ, 196.

Multiple stars, 40.

Musca Australis, 199.

Nebulæ, 66; list of, suitable for amateurs, 261; Sir J. Herschel's abbrevations, 97; variable, 99. Nebulous stars, 81. Norma, 200. Nubeculæ, 94.

Octans, 200.
Ophiuchus, 201.
Orbis lacteus, 111.
Orion, 203; nebula in, 85, 86.
Oxford Uranometria cited, 12, 120.

Parallax of stars, 6.
Pavo, 205.
Pegasus, 206.
Periodic stars, see Variable stars.
Phœnix, 210.
Photometry of stars, 5.
Pictor, 211.
Pisces, 212.
Piscis Australis, 213.
Piscis Volans, 234.
Planetary nebulæ, 76.
Pleiades, 59.
Pole star, north, 2; south, 200.
Præsepe (in Cancer), 61.
Proper motion of stars, 22.

Pyramids, remarkable circumstance connected with, 2.

Red Stars, Catalogue of, 291. Reticulum Rhomboidalis, 214.

Sagitta, 215.

Sagittarius, 216; cluster in, 65; nebulæ in, 90.
Scorpio, 218.
Sculptor, 220.
Sculum Sobieskii, 221; nebula in, 91.
Serpens, 222.
Sextans, 223.
Signs of the Zodiac; see Zodiac.
Spiral nebulæ, 74, 77.
Stars, double, 28; binary, 31; coloured, 36; multiple, 40; variable, 43; catalogue of Variable, 271; catalogue of Red, 291; catalogue of Binary, 318; temporary, 54.

Taurus, 224.
Taurus Poniatowskii, 117.
Telescopium, 226.
Temporary stars, 54.
Toucan, 227.
Triangulum, 228.
Triangulum Australe, 229.
Twinkling, 25.

Stellar parallax, 6.

Uranometria Argentina, 120. Ursa Major, 229. Ursa Minor, 232.

Variable stars, 43; Catalogue of, 271. Virgo, 233. Volans, 234. Vulpecula, 235; "Dumb-bell" nebula in, 91.

"Watling-street," III.
"Way to St. James's," III.
"Whirlpool" nebulæ, 74.

Zodiac, constellations in, 114; invention of, 15.

GENERAL INDEX TO A COMPREHENSIVE THE WHOLE WORK.

ABBE, C., Sun-spots and terrestial temperatures, vol. i. p. 39; Paper by, on the Distribution of Nebulæ, referred to,

Abbott, R., Observations by, of the

Nebula in Argo, i. 103.

Aberration of Light, what it is, i. 380; the constant of, i. 381; different values of, i. 381; history of the discovery of,

Aberrations, spherical and chromatic, of telescopes, ii. 13; how remedied, ii. 14;

tests for, ii. 15. Abney, Capt. W., his researches in meteorological spectroscopy, ii. 316; his photographs of the spectra, ii. 389, 413.

Abul Hassan Ali, his Catalogue of Stars,

ii. 488.

Abul Wefa, perhaps the discoverer of the Moon's variation, i. 120.

Abundantia (Minor Planet (151)), i. 662.

Acceleration, Secular, of the Moon's Mean Motion, i. 121.

Achernar (a Eridani), iii. 175; a star of the 1st magnitude, iii. 3.

Achromatism of telescopes, ii. 14, 296. Adams, an observer of the solar eclipse

of 1858, i. 292, 294.

Adams, J. C., his researches on the Moon's motions, i. 121; his unfair treatment by the French, i. 252; his researches in connection with Neptune, i. 253; observes the Solar eclipse of 1851, i. his researches as to meteor comets, i. 629; his researches on the secular acceleration of the Moon's mean motion, i. 121: his opinion on De Cheseaux's Cycle, ii. 463.

Adelheid (Minor Planet (276)), i. 668.

Adelinda (Minor Planet (229)), i. 666.

Adelmus the Monk, i. 44.

Adeona (Minor Planet (145)), i. 662.

Adjustments of Newtonian reflectors, ii. 11; of the Transit Instrument, ii. 129; of the Sextant, ii. 150, 161.

Adjustments of the Equatorial, ii. 111; different form of, suggested by Sir H.

Grubb, ii. 117.

Adorea (Minor Planet (268)), i. 668.

Adrastea (Minor Planet (239)), i. 666.

Adria (Minor Planet (143)), i. 662.

Ægina (Minor Planet (91)), i. 658.

Ægle (Minor Planet (%)), i. 658.

Æmilia (Minor Planet (159)), i. 662.

Aërolites, i. 589; chemical constitution of, i. 590; circumstances attending fall of, i. 591; ancient, i. 591; important modern, i. 592, 594; distribution of the falls of through the various months of the year, i. 593; some discovered the fall of which was not seen, i. 598; catalogues of, i. 596.

Æthra (Minor Planet (132)), i. 165, 660.

After-glow, Nubian, i. 393.

Agathe (Minor Planet (228)), i. 666.

Agathocles, Eclipse of, i. 324. Age of the Moon, ii. 448.

Aglaia (Minor Planet (48)), i. 656.

Air-bubbles in object-glasses, ii. 243.

Airy, Sir G. B., proposes to ascertain Sun's parallax by observations of Mars, i. 2; discovers the Long Inequality of Venus, i. 106; his account of the figure of the Earth referred to, i. 108; on the Moon's diameter, i. 118; on the Moon's motions, i. 122, 140; observes a remarkable spot on Jupiter, i. 176; his value of the period of Jupiter's rotation, i. 181; his connection with the discovery of Neptune, i. 253; observations of solar eclipses by, i. 275, 285, 286, 295; his researches on ancient eclipses, i. 322, 324; remarks by

him on Occultations, referred to, i. 357; his Memoir on Tides, cited, i. 361; his remarks on aberration, cited, i. 382; value of parallax, i. 385; his observations of Donati's comet in 1858, i. 410; his "Prismatic Eye-piece," ii. 29; his account of the "Northumberland" telescope at Cambridge, referred to, ii. 69; his form of Universal Equatorial, ii. 104; his modification of the Zenith Sector, ii. 168; his Reflex Zenith-Tube, ii. 170; invents the Orbit-sweeper, ii. 177; investigates the alleged changes in the great nebula in Argo, iii. 104; pendulum experiments by, ii. 484; measurement of arc between Valencia and Greenwich, ii. 484; his Catalogues of Stars, ii. 490,

491, 492, 493, 494. Airy, Miss, her observations of the

Pleiades, iii. 59.

Albategnius, his observations of the length of the day, ii. 423.

Albedo of stars, ii. 541.

Alceste (Minor Planet (124)), i. 660.

Alcmene (Minor Planet (82)), i. 658.

Alcor (ρ Ursæ Majoris), iii. 230, 258. Alcyone, one of the Pleiades, iii. 59; the Central Sun theory, iii. 24.

Aldebaran (a Tauri), iii. 224, 225, 240. A star of the 1st magnitude, iii. 4, 12; ancient names of, iii. 9; colour of, iii. 39; occultation of, i. 356; spectroscopic observations of, ii. 353, 354, 373, 376.

Aletheia (Minor Planet (259)), i. 668.

Alexandra (Minor Planet (55)), i. 656.

Algol (B Persei), iii. 4, 240. A well-known variable star, iii. 45; other stars of the same type, iii. 49; Pickering's theory as to its variability, ii. 376.

Algorab (8 Corvi), iii. 165; perhaps the centre of a system, iii. 25.

Alidad, ii. 542.

Aline (Minor Planet (266)), i. 668.

Alioth (& Ursæ Majoris), iii. 230, 231. Almanack, some account of, ii. 444; derivation of the word, ii. 445; for use in observations, ii. 263; Nautical, i. 355; ii. 262, 263; commencement of, ii. 478. Almucantar, ii. 173, 542.

Alphonsine Tables, ii. 423.

Al-Sufi, his Catalogue of Stars, ii. 48. Altair (a Aquilæ), iii. 130. A star of the 1st magnitude, iii. 4; various estimates of, iii. 11; parallax of, iii. 10; proper

motion of, iii. 23. Altazimuth instrument, ii. 164. Altazimuth mounting for reflectors, ii. 54.

Althæa (Minor Planet (119)), i. 660.

Amalthæa (Minor Planet (113)), i. 660.

Ambrosia (Minor Planet (193)), i. 664. American Nautical Almanac, ii. 263.

Amos, Prophet, cited, iii. 15.

Ampella (Minor Planet (198)), i. 664.

Amphitrite (Minor Planet (29)), i. 654; Tables for, i. 170. Amplitude, ii. 542.

Anabasis, Xenophon's, cited, i. 322.

Anagram on Venus, i. 105.

Anahita (Minor Planet (270)), i. 165, 668.

Anaxagoras on comets, i. 487; on the stars, iii. 18.

Anaximander, a disciple of Thales, discovers the obliquity of the ecliptic, i.

Anaximenes, on the stars, iii. 18.

Andromache (Minor Planet (175)), i. 165,

Andromeda (constellation), iii. 114, 125, 240. Meteors of, i. 612, 615, 623, 631, 635, 643; orbit of meteors in, i. 630, 635; spectrum of new star in, ii. 367; great nebula in, iii. 73; the nebula 18 H IV. in, iii. 86.

Angelina (Minor Planet (64)), i. 656.

Angle, definition of, ii. 542.

Angle of position of a double star, ii. 35,

Angle of situation, ii. 542.

Angström, his spectroscopic work, ii. 305, 308; his observations of the zodiacal light, ii. 338; his map of the solar spectrum, ii. 381.

Anna (Minor Planet (265)), i. 668.

Annual equation of the Moon, i. 121. Annular eclipses of the Sun, i. 262; red flames seen during, i. 284; of March 15, 1858, i. 291.

Annular nebulæ, iii. 69; 57 M Lyra, description of, iii. 69; list of, iii. 73.

Anomalistic year, ii. 422, 467. Anomaly of a planet or comet, ii. 542.

Antarctic Ocean, i. 370. Antares (a Scorpii), ii. 542; iii. 218, 219. A star of the 1st magnidude, iii. 4, 12; its colour, iii. 39.

Antigone (Minor Planet (129)), i. 660.

Antinous, iii. 115; treated as part of Aquila, iii. 129; cluster 11 M in, iii.

Antiope (Minor Planet (90)), i. 658. Antipodes, ii. 543.

Antlia Pneumatica (constellation), iii. 116, 126.

Antonia (Minor Planet (272)), i. 668.

Aphelion, Sun in, i. 8; derivation of the word, i. 57; ii. 543; of an orbit, i. 61; of Donati's comet, i. 57; of certain other comets, i. 484.

Apian, P., observes that comets' tails are turned from the Sun, i. 410.

Apis (constellation), iii. 115, 117.

Apogee, derivation of the word, ii. 543; Moon in, during eclipses, i. 268; daily motion of Sun in, ii. 419. Apollonius Pergæus, i. 116; on comets,

i. 487; his Life, by Philostratus, cited,

Apparatus Sculptoris (constellation), iii. 116, 220.

Apparent movements of the planets, i. 55.

Apparent noon, ii. 419.

Apsides, Line of, definition of, ii. 543; of the Earth's orbit, their annual motion, i. 110; of the Moon's orbit, i. 122.

Apus (alias Avis Indica, constellation),

iii. 115, 127.

Aquarius (constellation), iii. 115, 128; cluster 2 M in, iii. 66; radiant point of meteors in, i. 640; the nebula I H IV. in, iii. 80.

Aquila (constellation), iii. 114, 129. Ara (constellation), iii. 115, 131.

Arabian astronomy, i. 121. Arago, D. J. F., warning by, as to hasty generalisations, i. 36; on the relative brightness of the Sun's surface, i. 43; his polariscope experiment, i. 43; his remarks on Kepler's laws, i. 60; anecdote by, of General Buonaparte, i. 97; on the Lunar Librations, i. 120; his account of the Moon's surface referred to, i. 128; on the rainfall as affected by the Moon, i. 141; on the colour of Mars, i. 151; his remarks on the brightness of Jupiter's satellites, i. 196; note by, on the discovery of Uranus, i. 243; anecdote by, of Le Monnier, i. 244; on the compression of Uranus, i. 244; observes the dark Moon, i. 285; his ideas respecting certain phenonena seen during occultations, i. 357; on the position of a comet's nucleus, i. 399; on the character of the nuclei of comets, i. 410; his Catalogues of Meteors &c. referred to, i. 591, 596; his statistics as to meteors, i. 593, 602, 625; anecdote of the Paris clocks, ii. 420; his derivation of the word 'Almanack,' ii. 445; his remarks on variable stars, iii.

Aratus, his Diosemeia cited, iii. 61. Arc of the meridian, measurements of, ii. 481.

Arcs, various, ii. 543.

Archimedes (Lunar mountain), i. 129, 139.

Arcturus (a Boötis), ii. 543. A 18t magnitude star, iii. 3, 11, 143; parallax of, iii. 10; heat radiated by, iii. 21; proper motion of, iii. 23; perhaps the centre of a system, iii. 25; twinkling of, iii. 26; spectrum of, ii. 324; colour of, iii. 39.

Areas, Equal, Kepler's Law of, i. 57, 58. Areas of object-glasses, ii. 247.

Arete (Minor Planet (197)), i. 664.

Arethusa (Minor Planet (95)), i. 658. Argelander, F. G. A., his observations of

Vesta, i. 165; his suggestions for determining the brightness of the minor planets, i. 170; his maps, iii. 18; his statement as to the number of the stars, iii. 118; his investigation of the orbit of the comet of 1811, i. 447; his Uranometria Nova referred to, ii. 264; his researches as to Mira Ceti, iii. 43; his researches as to Algol, iii. 45; his researches as to β Lyræ, iii. 46; his statement of the place of Tycho Brahe's star, iii. 55; his estimate of the number of the stars visible to the naked eye, iii. 118; his Catalogues of Stars, ii. 490, 491, 492; his Atlases, ii. 503.

Argo (constellation), iii. 115, 132; lettering of, iii. 17; great nebula in, iii. 88, 103; star η in, iii. 46, 103.

Ariadne (Minor Planet (43)), i. 656.

Ariel (satellite of Uranus), i. 247. Aries (constellation), iii. 114, 140; first

point of, ii. 447, 543. Aristarchus of Samos, thought the Earth revolved round the Sun, i. 72, 116.

Aristarchus (Lunar mountain), i. 126,

Aristillus (Lunar mountain), i. 127. Aristotle, 1. 45, 359, 373, 487; iii. 112.

Aristyllus, i. 377. Armillary sphere, explanation of, ii. 543. Artaxerxes, i. 333.

Artemis (Minor Planet (105)), i. 658.

Artificial horizon, ii. 155.

Ascending node, of planetary orbits, i. 57; of cometary orbits, i. 282.

Ascension, Oblique, ii. 543. Ascension, Right, ii. 447, 543

Aschera (Minor Planet (214)), i. 666.

Ashtaroth, ii. 450.

Asia (Minor Planet (67)), i. 656.

Asporina (Minor Planet (246)), i. 668.

Assyrian astronomy, ii. 291.

Astarte, ii. 450.

Asteroids, ii. 543. See Minor Planets, i.

Asterope (Minor Planet (233)), i. 666; (one of the Pleiades), iii. 60.

Astræa (Minor Planet (5)), i. 654; name suggested for Uranus, i. 243.

Astrolabe, ii. 544.

Astrological influences of Mercury, i. 91; of Jupiter, i. 183, 241.

Astrology, ii. 544; iii. 17. Astrometer, Knobel's, ii. 191.

Astronomical instruments, ii. I.

Astronomical Society of London, its Catalogue of Stars, ii. 489.

Astro-Photo-Heliograph, at the Paris Observatory, ii. 177.

Atala (Minor Planet (152)), i. 662.

Atalanta (Minor Planet (36)), i. 656.

Ate (Minor Planet (112)), i. 660.

Athamantis (Minor Planet (230)), i. 666.

Athor (Minor Planet (161)), i. 662.

Atlases, celestial, names of, ii. 264, 486. Atmosphere, doubtful if Mercury has one, i. 89; of Venus, i. 100; of the Earth causes refraction, i. 387; probably none on the Moon, i. 134; of Mars, i. 159; of Jupiter, i. 174; of Saturn, i. 203.

Atropos (Minor Planet (273)), i. 668.

Auerbach, his observations of the solar eclipse of 1860, i. 298.

Augmentation of the Moon's semi-diameter, ii. 544.

Augusta (Minor Planet (254)), i. 668.

Augustus Cæsar, his reform of the Calendar, ii. 426.

Auriga (constellation), iii. 114, 141.

Aurora (Minor Planet (94)), i. 658.

Aurora Borealis and spots on the Sun, i. 31, 35; vibrations in comets' tails resembling, i. 412; no such phenomenon on Venus, i. 101.

Ausonia (Minor Planet (63)), i. 656.

Austria (Minor Planet (136)), i. 660.

Automatic Spectroscope, ii. 185.

Autumn, changes in the length of, i. 110. Autumnal equinox, i. 375; ii. 447.

Auwers, A., his observations of a variable nebula, ii. 102; his Catalogue of Stars, ii. 494, 495; his Catalogue of Nebulæ, ii. 501.

Auzout, on the Moon's atmosphere, i. 133; possesses a telescope of 600-feet focus,

Averroes, a Spanish Moor, i. 44.

Avis Indica (alias Apus, constellation), iii. 115, 127.

Axial rotations of the planets, i. 653; and See the several planets.

Axis, of the earth, ii. 446; of a planet, ii.

Azimuth, definition of, ii. 544.

B.

Backhouse, T. W., his observations of the Zodiacal Light, i. 147; his observations of a fireball in 1888, i. 605. Bacon, R., spectacles known to, ii. 291;

suggests the reform of the Calendar, ii.

426.

Bailly, S., writes on the history of ancient

astronomy, ii. 506.

Baily, F., his value of the earth's density, i. 5; describes the "beads" which bear his name, i. 277; notes the ruddy hue of the Moon during eclipses of the Sun, i. 284; investigates old eclipses, i. 324; his value of the Constant of Aberration, i. 381; B. A. Catalogue, ii. 490; revision of the constellations by, iii. 4, 17, 120; his Catalogues of Stars, ii. 489.

Baily's Beads, i. 277, 278, 279; photograph of, i. 307.

Ball, R. S., his Catalogue of Stars observed for parallax, ii. 494.

Ballot, B., traces a connection between the Sun's rotation and terrestrial temperatures, i. 3).

Baltic Sea, the tides in, i. 367.

Barbara (Minor Planet (234)), i. 666.

Bardou of Paris, equatorial made by, ii. 72.

Barlow lens, ii. 21.

Barlow-lens Micrometer, ii. 43.

Barnard, E. E., his observations of telescopic meteors, i. 646.

Barnard's periodical comet, i. 415, 427. Barneby, T., his observations of Jupiter's IIIrd satellite, i. 190.

Barnes, A., his Notes on Job, cited, iii. 15. Barometer, use of in determining refraction, i. 389; effect of changes of, on clocks, ii. 212; in observatory, ii. 220.

Bartsch, J., his Planisphærium referred to, ii. 488; his Catalogue of Stars, ii. 488. Base-lines, measurement of, ii. 481.

Baucis (Minor Planet (172)), i. 662. Baudouin, his account of the supposed

satellite of Venus, i. 103.

Baxendell, J., observes the transit of

Mercury of 1861, i. 342. Baxendell, J., jun., his observations of variable stars, cited, iii. 271.

Bayer, J., his lettering of the stars, iii. 9, 17; his Atlas, ii. 502.

Bayeux Tapestry, Halley's comet recorded in, i. 442.

Beatrix (Minor Planet (83)), i. 658.

Becquerel, his spectroscopic researches, ii.

Bede, his reference to Adelmus, i. 44. Beechey, Adm. F. W., his remarks on the tides in the Pacific, i. 369.

Beechey, Rev. Canon, on the appearance of the Moon during a lunar eclipse, i.

331.

Bedford Observatory, ii. 196; Equatorial of, ii. 68; Transit Instrument of, ii.120, 204; Floating Collimator used at, ii. 171.

Beer and Mädler, their observations of Mercury, i. 89; their observations of Venus, i. 99; measurements of lunar mountains, i. 124; favour the idea of a lunar atmosphere, i. 134; joint map of the Moon, i. 139; ii. 503; on the orbits of Saturn's satellites, i. 232; their observations of the lunar eclipse of 1883, i. 326.

Behrmann, his Atlas des südlichen gestirnten Himmels referred to, ii. 264,

504.

Belgrade, siege of, i. 331.

Belisana (Minor Planet (178)), i. 664.

Bellatrix (γ Orionis), iii. 203, 204; perhaps the centre of a sidereal system, iii.

Belli, his explanation of a phenomenon seen during eclipses of the Sun, i. 276.

Bellona (Minor Planet (28)), i. 654.

Belts, of Jupiter, i. 174; of Saturn, i. 205. Bergeron's experiment in imitation of lunar volcanoes, i. 125.

Berlin Academy Star Maps, ii. 503. Berliner Astronomisches Jahrbuch, ii. 263. Berosus, hemisphere of, ii. 444.

Bertha (Minor Planet (114)), i. 662.

Berthon, Rev. E. L., his dynamometer, ii. 23; observatory planned by, ii. 220. Bertrand, his discussion of the alleged

satellite of Venus referred to, i. 104. Berzelius, J. J., his analysis of aërolites.

Bessel, F. W., memoir by, on the Moon's Atmosphere, i. 128; unable to assign a

value to Mars's compression, i. 149; his measures of Saturn referred to, i. 203, 222; on the mass of Saturn's rings, i. 231; on the orbit of Titan, i. 234; his

value of Precession, i. 375; his Tables of Refraction referred to, i. 392; drawings of Halley's comet by, i. 440; suggests observations of stars in the Prime Vertical, ii. 156; his Catalogues of Stars, ii. 489, 490, 492.

Bestiary, old name for the ecliptic, i. 116. Betelgeuse (a Orionis), iii. 203, 205. A star of the 1st magnitude, iii. 3; ancient name of, iii. 9; its brightness, iii. 11; its spectrum, ii. 353, 354.

Bettina (Minor Planet (250)), i. 668.

Bianca (Minor Planet (218)), i. 666.

Bianchini, his value of the Sun's rotation, i. 14; his observations of Venus, i. 98; his observations of Jupiter, i. 195.

Bible, references to-

Gen. i. 14, ii. 418; iii. 16. Gen. viii. 22, i. 374. Exod. xii. 18, ii. 450. Exod. xx. 11, ii. 433. Lev. xvii. 7, i. 490. Lev. xxiii, 5, ii. 450. Job ix. 9, iii. 15. Job xxxviii. 31-2, iii. 15.

Isaiah xiv. 12, i. 104, 490. Jer. i., i. 553.

Daniel, ii. 461. Amos v. 8, iii. 15. St. Jude 13, i. 490. Revelation, ii. 461.

Rev. xii. 3, i. 490. Bible allusions to Comets, conjectured, i. 489; to stars, iii. 15.

Bidder, G. P., his micrometer, ii. 37. Biela's Comet, i. 408, 430, 521-30 passim, 548, 631.

Binary Stars, Catalogue of, iii. 318. Biot, E., researches as to Chinese comets, i. 411, 551; iii. 332.

Birds, effect on, of eclipses of the Sun, i. 272, 293, 305.

Birmingham, J., observes a temporary star in Corona Borealis, iii. 56; his Catalogue of Red Stars cited, iii. 291, 294.

Birt, W. R., spots on the Sun observed by, i. 16; his Map of the Moon, i. 140; his observations of the Zodiacal Light, i. 146; his hints on observing the moon,

Bishop, G., his Star Charts, ii. 503. Bissextile, origin of the term, ii. 424.

Blainpain's comet, i. 430, 434, 526. Blakesley, Dean, his Herodotus referred

to, i. 323. Bode, J. E., his so-called Law, i. 67; suggests a name for the planet Uranus, i. 243; adds to the number of the constellations, iii. 117; his Catalogue of Stars, ii. 489; his Atlas, ii. 502.

Bohnenberger's Collimating Eye-piece, ii.

Bolometer, Langley's, ii. 389.

Bond, G. P., his estimate of the Moon's light, i. 138; his estimate of Jupiter's reflective power, i. 182; discovers Saturn's Dusky Ring, i. 212; his estimate of the thickness of Saturn's rings, i. 222; on the shading of Saturn's Interior Ring, i. 228; his Memoir on Donati's Comet referred to, i. 457; his drawing of the great nebula in Andromeda, iii. 73; his Catalogue of Nebulæ,

Bond, W. C., his observation of Jupiter's IIIrd satellite, i. 189; his drawings of Saturn "beaded," i. 225; his observations of Neptune, i. 258; his photographs of stars, ii. 391; his Catalogue

of Stars, ii. 491.

Bonn Observatory Atlas, ii. 503.

Bonpland, his observations of shooting stars in 1799, i. 616.

Books, useful in an observatory, ii. 263, 265; relating to astronomy, ii. 506.

Boötes (constellation), iii. 114, 143; the star a in, see Arcturus.

Borda, his repeating circle, ii. 167.

"Bore," the, on the Severn, i. 371. Boreel, his statement respecting the invention of the microscope, i. 292.

Borelli, his inquiries respecting the invention of the telescope, ii. 292.

Bosanquet, J. W., on ancient solar eclipses, i. 325.

Bouger, his estimate of the Sun's light, i. 8; of the Moon's light, i. 138.

Boulliaud, his theory as to variable stars,

Bouvard, A., his Tables of Jupiter, i. 199;

his Tables of Saturn, i. 241; his Tables of Uranus, i. 250; investigates the motion of Uranus, i. 252.

Box-sextant, ii. 160, 163.

Bradley, Rev. J., observes Uranus as a fixed star, i. 244; his discovery of nutation, i. 378; his Catalogue of Stars, ii. 488.

Brady, his Clavis Calendaria cited, ii.

440, 442. Brahe, Tycho; see under "Tycho."

Branfill, Capt., his observations of the solar corona in 1868, i. 305.

Brass-work, cleaning of, ii. 249. Bredechin, his paper on the Tails of Comets referred to, i. 413; his pamphlet on Shooting Stars referred to, i. 608.

Breen, J., his observations of Venus, i.

Bremiker, his Book of Logarithms referred to, ii. 265.

Brett, J. W., his opinion as to Jupiter's spots, i. 180; his altazimuth mounting for reflectors, ii. 55.

Brewster, Sir D., on the cause of the Sun's corona, i. 280; his spectroscopic researches, ii. 306; maps the atmospheric bands, ii. 311.

Bright, H. E. R., his drawing of the solar

eclipse of 1874, i. 315. Brisbane, Sir T. M., his Catalogue of Stars, ii. 490; observes η Argûs, iii. 47.

Bristol, the tides at, i. 371.

British Association, Meteor Committee of, i. 635; Catalogue of Stars, ii. 265, 490. Brodie, F., his observations of Sun-spots,

i. 20; of a solar storm, i. 32; his drawing of Mars, i. 151; his observations of the transit of Venus in 1882, i. 354; his drawings of the great comet of 1861, i. 463; his observations of Coggia's comet in 1874, i. 468; his modification of the German equatorial, ii. 71; his use of a box-sextant, ii. 160; his meridian mark, ii. 208; design for an observatory by, ii. 220.

Brodie, C. G., his observations of red

stars, iii. 293.

Brooks, W. R., his observations of the great comet of 1882, i. 477, 478; discovers various comets, i. 543, 545, 547; his observations of telescopic meteors, i. 645.

Brorsen's periodical comet, i. 415, 425, 531-541 passim, 548; spectrum of, i.

425; ii. 343.

Brothers, A., his photographs of the solar eclipse of 1870, i. 313; his atlas, ii. 504.

Browning, J., his observations of Venus, i. 100; his observations of Saturn, i. 205; his Suggestions for the use of Reflectors cited, ii. 249; observes meteors with a spectroscope, ii. 350.

Bruhns, C., his observations of the solar eclipse of 1860, i. 296; his Atlas, ii. 504.

Brunhilda (Minor Planet (123)), i. 660. Brunnow, F., investigates the orbit of Di

Vico's comet, i. 433. Buchanan, Planets mentioned by Bur-

mese, i. 246.

Buchner, his Catalogues of Aërolites referred to, 596.

Buffham, T. H., his observations of Jupiter's satellites, i. 195; on the ellipticity of Uranus, i. 245; on the rota-

tion of Uranus, i. 245. Bunsen, observations of solar spectrum, ii. 308; his map of the spectrum, ii.

379. Burchell, his observations of η Argûs,

Burckhardt, his Tables of the Moon, i.

140; infers the existence of a planet beyond Uranus, i. 253.

Burmese enumeration of the planets, i.

246.

Burnham, S. W., his Bright-wire Micrometer, ii. 40; Catalogues of Double Stars, ii. 498, 499.

Burr, T. W., his observations of the Zodiacal Light referred to, i. 143.

Burton, his spectroscopic observations of

the Zodiacal Light, ii. 328.

Busch, his daguerreotype of the solar eclipse of 1851, i. 312; his value of the coefficient of nutation, i. 378.

Byblis (Minor Planet (199)), i. 664.

C.

Cacciatore, N., thinks he observed a phase in the comet of 1819, i. 410. Cela Sculptoris (constellation), iii. 116,

Cæsar, Julius, understands the connection between the Moon and the Tides, i. 373; reform of the Calendar by, ii. 424. Cagnoli, A., his Catalogues of Stars, ii. 489.

Calendar, general account of, ii. 445; Gregorian, ii. 424; Julian, ii. 426; Jewish, ii. 436; Greek, ii. 436; Roman, ii. 437; French Revolutionary, ii. 440.

Calends, Greek, ii. 438.

Calippus, his estimate of the length of the year, ii. 423; his Cycle, ii. 456, 463.

Calixtus III., Pope, afraid of the comet of 1456, i. 488.

Callimachus, his views on the circumpolar stars, iii. 18.

Calliope (Minor Planet (22)), i. 654.

Callisto (name suggested for one of the satellites of Jupiter), i. 185; Minor Planet (204), i. 664.

Calorific rays of the Sun, i. 7; of the Moon, i. 138.

Calypso (Minor Planet (54)), i. 656.

Cambridge Observatory, Catalogue of Stars formed at, by Airy, ii. 490.
Camelopardus (constellation) iii 116

Camelopardus (constellation), iii. 116, 143.

Camilla (Minor Planet (107)), i. 166, 660.

Campani, makes a telescope of 136-ft. focus, ii. 294.

Cancer (constellation), iii. 115, 146; what it might symbolise, iii. 15; cluster in, iii. 61.

Canes Venatici (constellation), iii. 116,

147; cluster 3 M in, iii. 63; spiral nebula 51 M in, iii. 74.

Canis Major (constellation), iii. 115, 148; star \alpha in (Sirius), iii. 3, 148, 149; parallax of, iii. 10; brightness of, iii. 11; perhaps the centre of a system, iii. 25; colour of, iii. 39.

Canis Minor (constellation), iii. 115, 149. Cannon-balls as rollers for observatory

roofs, ii. 200.

Canopus (a Argus), a 1st magnitude star, iii. 3, 128; parallax of, iii. 10; not included in *Harvard Photometry*, iii. 12; perhaps the centre of a system, iii. 25.

Capella (a Aurigæ), iii. 141, 142; a star of the 1st magnitude, iii. 3, 11; parallax of, iii. 10; brightness of, iii. 11; colour of, iii. 39; perlaps the centre of a system, iii. 25; said to have undergone changes of colour, iii. 39.

Capocci, observations of Sun-spots, i. 25. Cappelletti and Rosa, their drawings of the comet of 1860 (iii.), i. 459.

Capricornus (constellation), iii. 115, 151. Capron, J. R., his researches on the rainband, ii. 315.

Cardboard discs recommended for use by Sir J. Herschel, ii. 285.

Carl, P., his Catalogue of Comets, ii. 505. Carlini, his researches on the Theory of the Moon referred to, i. 140.

Carolina (Minor Planet (235)), i. 666.

Carpenter, J., his observations of Saturn's dusky ring, i. 217; his observations of Encke's comet in 1871, i. 471.

Carrington, R. C., on the distribution of Sun-spots, i. 10; on currents in the solar photosphere, i. 15; observes an explosion on the Sun in 1859, i. 32; his Catalogue of Circumpolar Stars, ii. 491.

Cassandra (Minor Planet (114)), i. 660.

Cassegrain, invents the telescope which bears his name, ii. 2, 295.

Cassegrainian Telescope, ii. 2.

Cassini, J., defends his father's observation of Venus, i. 98; asserts that the comet of 1744 exhibited phases, i. 409; notes the proper motion of Arcturus, iii. 23.

iii. 23.
Cassini, J. D., his observations of spots on Venus, i. 98; suspects a satellite of Venus, i. 102; suspects an active volcano on the Moon, i. 126; his Map of the Moon, i. 139; his observations of the Zodiacal Light, i. 144; ascertains the period of Mars's rotation, i. 158; ascertains the period of the rotation of Jupiter, i. 176, 181; his observations of Saturn's ring, i. 208; his observations of Iapetus, i. 240; of an occultation

of a star by Titan, i. 241; observes an occultation of a star by Mars, i. 360.

Cassiopeia (constellation), iii. 114, 152; the temporary star of 1572 in, iii. 54. Castor (a Geminorum), iii. 11, 178, 179; a star of the 1st magnitude, iii. 11.

Catalogue of aërolites, i. 592; of calculated comets, i. 511; of recorded comets, i. 550; of eclipses, i. 334.

Catalogues of Stars for the use of amateurs, ii. 265; general list of all the chief ones published, ii. 487.

Celuta (Minor Planet (186)), i. 664.

Centaurus (constellation), iii. 115, 154; cluster in, iii. 90; a in, a star of the 1st magnitude, iii. 3; parallax of, i. 385.

Centering of lenses, ii. 243, 289.

Central Sun hypothesis, Mädler's, iii. 24. Cepheus (constellation), iii. 114, 156.

Ceres (Minor Planet (1)), i. 165, 166, 167, 654.

Cetus (constellation), iii. 115. 158; spectrum of star Mira in, ii. 368; general account of that star, iii. 43.

Chacornac, his observations of Sun-spots, i. 25; unsuccessfully searches for a variable nebula in Taurus, iii. 100; imagines another variable nebula in Taurus, iii. 103; his Atlas, ii. 503.

Chairs and seats for observatories, ii. 215. Chaldæan astronomy, i. 265, 332.

Challis, Rev. J., his paper on the Moon's Atmosphere cited, i. 128; his con-nection with the history of Neptune's discovery, i. 254; his observations of the comet of 1862 (iii.), i. 467, 469; his Practical Astronomy referred to, ii. 1, 164 et seq., 192; on achromatic combinations of lenses, i. 15; his methods of recording transit observations of planets referred to, ii. 136; his method of finding the meridian, ii. 195; his remarks on the management of clocks, ii. 210; hints on sweeping for objects, ii. 273.

Chamæleon (constellation), iii. 115, 160. Chambers, G. F., drawing of the great comet of 1861, i. 463; Catalogue of Red Stars, ii. 495; Catalogue of Variable Stars, ii. 492; Catalogue of Comets, ii.

Chandler, S. C., recommends the squarebar micrometer, ii. 44; his Catalogue of Variable Stars, ii. 495; his analysis of variable stars, iii. 50.

Charts, celestial, ii. 502; necessary in searching for minor planets, i. 168; discovery of Neptune by means of, i. 254.

Charts of the Moon, i. 139.

Chasles, his catalogue of shooting stars referred to, i. 625.

Chauvenet, his Spherical Astronomy referred to, ii. 1, 266.

Chemical rays of the Sun, i. 43. Chepstow, the tides at, i. 368.

Cheseaux, De, observes the comet of 1744, i. 411; his cycles, ii. 460.

Childrey, his observations of Zodiacal Light referred to, i. 144.

Chinese observations: conjunctions of planets, i. 70; of Mercury, i. 90; of the obliquity of the ecliptic, i. 110; possible invention of the Zodiac by, i. 117; of eclipses, i. 321; of comets, i. 411, 551; of aërolites, i. 590; of new stars, iii.

Chladni, his researches on aërolites, i. 589; his Catalogues of aërolites referred to, i. 596.

Christie, W. H. M., observes the spectrum of Hartwig's comet, ii. 344.

Chromatic aberration, ii. 13.

Chromosphere of the Sun, i. 52; spectrum observations of, ii. 335.

Chronograph, described, ii. 135; use of, in observatories, ii. 215.

Chronological astronomy, ii. 417.

Chronology, light thrown upon by ancient eclipses, i. 321; different modes of reckoning, ii. 460.

Chronometers, useful to amateurs, ii. 259; Captain Shadwell's book on the management of, cited, ii. 156, 211.

Chryseis (Minor Planet (202)), i. 664.

Cicero, i. 322; his De Natura Deorum cited, i. 90; his Academica Quastiones cited, i. 116.

Circe (Minor Planet (34)), i. 654.

Circinus (constellation), iii. 116, 160. Circle Hour, ii. 69; Mural, ii. 165; Repeating, ii. 167; Reflecting, ii. 168.

Circles for telescopes, ii. 251.

"Circulus Lacteus," an old name for the Milky Way, iii. 111.

Civil year, ii. 442.

Clairaut, investigates the orbit of Halley's comet in 1759, i. 439.

Clapham, T. R., design for an observatory

by, ii. 194, 229. Clark, Alvan, American optician, ii. 296, 297; his Catalogue of Double Stars,

ii. 497. Clark, L., his popular Transit Instruments, ii. 141, 143.

Clarke, A. R., his opinion as to the figure of the Earth, i. 108.

Clavius, observes the Sun's corona in 1567, i. 281.

Cleaning of lenses, ii. 248, 289.

Cleanthes of Assos, his ideas respecting the Earth and the Sun, i. 71.

Clementina (Minor Planet (252)), i. 668.

Cleopatra (Minor Planet (216)), i. 666.

Clepsydra, ii. 445.

Climate, depends upon the inclination of a planet's axis, i. 109.

Clio (Minor Planet (84)), i. 658.

Clock-motion for equatorials, ii. 69, 77, 251; how to extemporise it, ii. 252.

Clocks, for observatories, ii. 209, 259; regulation of, ii. 210, 420; first in England, ii. 472.

Clotho (Minor Planet (97)), i. 658.

Clouds, average prevalence of, in England,

ii. 284.

Clusters and nebulæ, iii. 58; arranged in three classes, iii. 58; five kinds of nebulæ, iii. 58; the Pleiades, iii. 59; the Hyades, iii. 60; mentioned by Homer, iii. 59; Præsepe, iii. 61; opinion of Aratus and Theophrastus, iii. 61; Coma Berenices, iii. 61; list of important clusters, iii. 62; annular nebulæ, iii. 69; elliptic nebulæ, iii. 73; spiral nebulæ, iii. 74; planetary nebulæ, iii. 75; nebulous stars, iii. 81; list of irregular clusters, iii. 83; notes to the objects in the list, iii. 83; the nubeculæ major and minor, iii. 94; list of nebulæ in Sir J. Herschel's Catalogue of 1864, iii. 95; historical statement relating to the observation of nebulæ and clusters, iii. 96; Catalogue of, iii. 261; hints on the observation of, ii. 274.

Clymene (Minor Planet (104)), i. 658.

Clypius Sobieskii. See Scutum Sobieskii.

Clytemnestra (Minor Planet (179)), i. 664.

Clytie (Minor Planet (73)), i. 658.

"Coal Sack," the, iii. 109.

Cœlestina (Minor Planet (237)), i. 666.

Coggia's Comet of 1874, vibrations seen in its tail, i. 412; general description of, i. 468; spectrum of, ii. 344.

Colbert, his review of the Intra-Mercurial Planet controversy referred to, i.

85.

Collimator, Kater's Floating, ii. 170. Collingwood, Dr., his observations of the annular eclipse of 1858, i. 293. Collision of a comet with the Earth, the

question considered, i. 400, 431.

Coloured glasses for viewing the Sun, ii. 266; for viewing the Moon, ii. 269. Coloured stars, iii. 36.

Colours of stars, ii. 278.

Columba Noachi (constellation), iii. 116, 161.

Columbus, Christopher, anecdote of, concerning eclipse of the Moon, i. 333.

Coma Berenices (constellation), iii. 115, 162; as a group of stars, iii. 61.

Coma of a comet, i. 399.

Comets, i. 395; always objects of popular interest, and sometimes of alarm, i. 395; usual phenomena attending the development of a comet, i. 396; telescopic comets, i. 399; comets diminish in brilliancy at each return, i. 399; period of revolution, i. 400; density, i. 400; mass, i. 400; Lexell's comet, i. 400; general influence of planets on comets, i. 400; special influence of Jupiter, i. 400; comets move in one of 3 kinds of orbits, i. 401; element of a comet's orbit, i. 403; for a parabolic orbit, 5 in number, i. 404; direction of motion, i. 405; eccentricity of an elliptic orbit, i. 406; the various possible sections of a cone, i. 406; early speculations as to the paths in which comets move, i. 407; comets visible in the daytime, i. 407; breaking up of a comet into parts, i. 408; instance of Biela's comet, i. 408; Liais's observations of comet iii. 1860, i. 409; comets probably selfluminous, i. 409; existence of phases doubtful, i. 409; comets with planetary discs, i. 410; phenomena connected with the tails of comets, i. 410; usually in the direction of the radius vector, i. 410; secondary tails, i. 412; vibration sometimes noticed in tails, i. 412; Olbers's hypothesis, i. 412; variation in the appearance of comets exemplified in the case of that of 1769, i. 413; transits of comets across the Sun, i. 413; sweeping for, ii. 93; hints on observations of, ii. 274; spectra of comets, ii. 342, 387; the ordinary type, ii. 343; Tebbutt's Comet, ii. 346; Schäberle's Comet, ii. 347; Wells's Comet, ii. 347; the Great Comet of 1882, ii. 347;. photographs of, ii. 403.

Comets, periodic, i. 415; conveniently divided into three classes, i. 415; comets in Class I., i. 415; Encke's Comet, i. 416; the resisting medium, i. 419; table of periods of revolution, i. 420; Tempel's Second Comet, i. 424; Winnecke's Comet, i. 424; Brorsen's Comet, i. 429; Tempel's First Comet, i. 426; Swift's Comet, i. 426; Bar-

nard's Comet, i. 427; D'Arrest's Comet, i. 427; Finlay's Comet, i. 428; Wolf's Comet, i. 429; Faye's Comet, i. 429; Denning's Comet, i. 430; Méchain's Comet of 1790, i. 430; now known as Tuttle's Comet, i. 430; Biela's Comet, i. 430; Di Vico's Comet of 1844, i. 433; list of comets presumed to be of short periods but only once observed, i. 434; comets in Class II., i. 435; Westphal's Comet, i. 435; Pons's Comet of 1812, i. 435; Di Vico's Comet of 1846, i. 435; Olbers's Comet of 1815, i. 437; Brorsen's Comet of 1847, i. 435; Halley's Comet, i. 437; of special interest, i. 437; résumé of Halley's labours, i. 437; its return in 1759, i. 439; its return in 1835, i. 439; its history prior to 1531 traced by Hind, i. 440; comets in Class III. not requiring detailed notice, i. 444; comets supposed to be associated in groups with certain planets, i. 444.

Comets, remarkable, i. 446; the Great Comet of 1811, i. 446; the Great Comet of 1843, i. 447; the Zodiacal Light mistaken for it, i. 143; the Great Comet of 1858, i. 448; the Comet of 1860 (iii.), i. 457; the Great Comet of 1861, i. 457; the Comet of 1862 (iii.), i. 467; the Comet of 1864 (ii.), i. 467; the Comet of 1874 (iii.), i. 468; the Comet of 1882 (iii.), i. 474; its spectrum, ii.

348.

Conets, dimensions of, i. 482; dimensions of the nuclei, i. 482; of the come, i. 483; comets contract and expand on approaching to, and receding from, the Sun, i. 483; exemplified by Encke's in 1838, i. 483; comets waste away, i. 483; lengths of the tails of comets, i. 484; dimensions of cometary orbits, i. 484; periods of comets, i. 484; number of comets recorded, i. 485; duration of visibility of comets, i. 485; unknown comet found recorded on a photograph of the eclipse of the Sun of May 17, 1882, i. 486.

Comets, historical notices of, i. 487; opinions of the ancients on the nature of comets, i. 487; superstitious notions associated with them, i. 488; extracts from ancient Chronicles, i. 488; Pope Calixtus III. and the comet of 1456, i. 488; extracts from the writings of English authors of the 16th and 17th centuries, i. 489; Napoleon and the comet of 1769, i. 489; supposed allusions in the Bible to comets, i. 489.

Comets, Catalogues of, i, 511, 550; Niesten's arranged in order of Inclinations,

referred to, i. 511; Lists of Catalogues of, ii. 504.

Comet-seeker, ii. 93, 181.

Comfield, R., observes occultation of Saturn in 1825, i. 359.

Common, A. A., observes a transit of Titan's shadow across Saturn, i. 238.

Comparative sizes of the Sun and planets, i. 63, 64, 65; of certain comets, i. 398.

Compensation pendulums, ii. 210.

Complementary colours in the case of double stars, iii. 36.

Compression of Mercury, i. 86; of Venus, i. 94; of the Earth, i. 108; of Mars, i. 148; of Jupiter, i. 173; of Saturn, i. 203.

Concordia (Minor Planet (58)), i. 656.

Condé, his History of the Arabs cited, i. 615.

Conjugate axis of an ellipse, i. 61.

Conjunctions of the planets, i. 68; of the Moon, ii. 448.

Connaissances des Temps, ii. 263. Constant of aberration, i. 381. Constantine, Emperor of Rome, ii. 458.

Constellations, iii. 114; list of those formed by Ptolemy, iii. 114; subsequent additions, iii. 115; remarks by Herschel, iii. 117; Catalogue of the Constellations, with the position of, and stars in, each, iii. 119.

Continents on the Earth and Mars com-

pared, i. 150.

Cook, Capt. J., observes the transit of

Venus of 1769, i. 348.

Cooke, T., optician at York, his altazimuth mounting, ii. 52; equatorials by, ii. 72 et seq.; his observatory ladder, ii. 217; large telescopes by, ii. 297.

Cooper, E. J., his Cometic Orbits referred to, i. 434; his Catalogue of Stars, ii. 491; his Catalogue of Comets, ii.

505.

Copeland, R., remarkable phenomenon observed by him during an occultation in 1863, i. 357; his spectroscopic observations of Comet iii., 1877, ii. 343; of other comets, ii. 347; four remarkable stars discovered by, ii. 364; his observations of Nova Andromedæ, ii. 367; his Catalogue of Stars, ii. 493.

Copernican system, i. 72. Copernicus, fails to see Mercury, i. 91; anecdote of, respecting Venus, i. 105; explains precession, i. 377.

Copernicus (Lunar mountain), i. 128. Cor Caroli (α Canum Venaticorum), iii.

Cornu, his value of the velocity of light,

i. 380; his spectroscopic researches, ii. 313, 389.

Corona in eclipses of the Sun, i. 53, 280, 289, 290, 305, 309, 311; spectrum observations of, ii. 335.

Corona Australis (constellation), iii. 115,

163. Corona Borealis (constellation), iii. 114, 164; variable star in, iii. 46; spectrum of variable star in, ii. 365; temporary star in, discovered by Birmingham, iii. 56.

Coronis (Minor Planet (158)), i. 662. Correction of object-glasses, ii. 14. Corrugations on the Sun's surface, i. 50. Corvus (constellation), iii. 115, 165. Co-tidal lines round the British Isles, i.

Coudé equatorial at Paris, ii. 109. Conlyier-Gravier, his observations of shooting-stars referred to, i. 609.

Couplet, Jesuit missionary at Pekin, his account of Chinese comets, i. 551. "Crab nebula" in Taurus, iii. 85.

Crabtree, W., observes the transit of Venus of 1639, i. 347.

Crater (constellation), iii. 115, 166.

Crawford, Earl of, his plan for extemporising an equatorial, ii. 66. See also "Lindsay, Lord."

Croll, J., Papers by, referred to, i. 111. Crookes, W., his photographs of the Moon, ii. 393.

Crown glass, its use, in the construction of achromatic object-glasses, ii. 14.

Cruls, his observations of the great comet of 1882, i. 481; his observations of Sawerthal's comet of 1888, i. 481.

Crux (constellation), iii. 116, 167; cluster in, iii. 89; the star a in, iii. 4. Crystalline sphere, ancient ideas of, iii.

Ctesibius, of Alexandria, invents the clepsydra or water-clock, ii. 444.

Culmination of the stars, iii. 237. Currents of the ocean as affecting tides, i. 366.

Cusa, Cardinal, advocates the reform of the Calendar, ii. 427.

Cuttle, Captain, his principle, ii. 264.

Cybele (Minor Planet (65)), i. 656. Cycles used in chronology, ii. 454; Calip-

pic, ii. 456; Lunar or Metonic, ii. 457; De Cheseaux's, ii. 460. Cygnus (constellation), iii. 114, 168; the

star a in, iii. II; a green star, iii. 39; its spectrum, ii. 385; temporary star in, discovered by Schmidt, iii. 55; its spectrum, ii. 367.

Cyrene (Minor Planet (133)), i. 660.

D.

D'Ailly, P., Cardinal, and the reform of

the Calendar, ii. 426. Damoiseau, M. C. T. De, his tables of Jupiter's satellites, i. 199.

Danaë (Minor Planet (59)), i. 656.

Dancer, J. B., his photographs of the

Moon, ii. 393. D'Arrest, H. L., unsuccessfully searches for a satellite of Mars, i. 159; his remarks on the minor planets, i. 167; notes certain coincidences respecting Jupiter's satellites, i. 194; his labours in regard to nebulæ, iii. 97; his remarks on the distribution of planetary nebulæ, iii. 81; misses a nebula in Taurus, iii. 100; observes Tuttle's supposed variable nebula in Draco, iii. 102; his Catalogues of Nebulæ, ii. 500,

D'Arrest's periodical comet, i. 415, 427, 532-541 passim, 548.

Daguerreotype pictures of the Sun, ii. 390.

Dapline (Minor Planet (41)), 656.

Davidson, his observations of Saturn's dusky ring, i. 217.

Davis, photographs of the solar eclipse of

1871, i. 309. Dawes, W. R., observations of Sun-spots by, i. 17; observations of faculæ by, i. 46; his value of Mercury's compression, i. 86; observes spots on Jupiter, i. 177; observes Jupiter apparently devoid of satellites, i. 195; his observations of Saturn's rings, i. 211; discovers Saturn's dusky ring, i. 212; on the colour of Saturn's ring, i. 228; observes an eclipse of Titan, i. 238; observes the red flames in the solar eclipse of 1851, i. 282; observes the transit of Mercury of 1848, i. 342; suggests that a star occulted by the Moon not disappearing suddenly may be a double star, i. 357; observes an occultation of Saturn, i. 358; observes shooting stars in 1866, i. 619; first uses the combination known as the Barlow Lens, ii. 21; his Catalogue of Double Stars, ii. 496, 497.

Dawes's solar eye-piece, ii. 26, 267. Day, length of, i. 115; ii. 418; sidereal, ii. 418; solar, ii. 418; days of the week, English names of, derived from the Anglo-Saxon, ii. 434; Latin names of, derived from the planets, ii. 434.

De Charmères, perhaps the inventor of the heliometer, ii. 177.

Declination of a heavenly body, ii. 447. Declination axis of an equatorial, ii. 67. De Cuppis, P., observes a round spot on

the Sun, i. 79.

Dee, Dr. J., his allusion to "perspective glasses," ii. 292.

Defective illumination of the Moon's disc, transit observations during, ii. 137. D'Eglantine, F., author of the French

Republican Calendar, ii. 441.

De Gasparis, A., discovers several minor planets, i. 168, 654.

Deimos, one of the satellites of Mars, i.

Deiopeia (Minor Planet (184)), i. 664.

Dejanira (Minor Planet (157)), i. 662,

Delambre, J. B. J., asserts that the comet of 1682 exhibited phases, i. 409; anecdote by, of the Paris clocks, ii. 420.

De La Rue, W., observations of Sun-spots, i. 34; his measurements of the Moon's diameter, i. 118; his engraving of Saturn, i. 211, 212, 220, 228; his measures of Saturn, i. 222; suspects the existence of mountains on Saturn's rings, i. 228; observes the solar eclipse of 1860, i. 274; unsuccessfully tries to photograph the Great Comet of 1861, i. 462; his photographs of the Moon, ii.

Delauney, C. E., his investigations on the theory of the Moon, i. 121, 140.

Delisle, De R., his suggestion as to cause of the Sun's corona, i. 280.

Delphinus (constellation), iii, 114, 171. De Mailla, Jesuit missionary at Pekin, verifies a Chinese conjunction of planets, i. 70; his account of Chinese comets, i. 551.

Dembowski, Baron E., his measures of double stars referred to, 35; his Catalogues of Double Stars, ii. 497, 498, 499. Demetrius, king of Syria, comet seen after

his death, i. 410, 554.
Democritus of Abdera, his anticipations of new planets, i. 67; his ideas on comets, i. 487; his estimate of the length of the year, ii. 423; his speculations as to the Milky Way, iii. 112.

De Morgan, Prof., on an alleged anecdote of Copernicus, i. 105; anecdote by, relating to the Reformed Calendar, ii. 428; his memoir on Easter referred to, ii. 451; his Book of Almanacs referred to, ii. 453; his account of epochs used in chronology referred to, ii. 460.

Deneb (a Cygni), iii. 168, 170; a star of the 1st magnitude, iii. 11; colour of,

iii. 39.

Denning, W. F., his observations of Mercury, i. 88; ascertains the period of Mars's rotation, i. 158; his observations

of a red spot on Jupiter, i. 178; on meteoric astronomy, i. 589; drawing of fire-ball observed by, i. 600; his observations on a fire-ball in 1888, i. 605; his suggestion as to the origin of telescopic meteors, i. 649; hints on searching for comets, ii. 273.

Denning's periodical comet, i. 415, 430. Density of the Sun, i. 5; of the Earth, i. 5; of the planets, i. 68, 652. See also the several planets.

Denza, F., his observations of shooting

stars in 1885, i. 623.

Derham, Rev. W., mentions the ashy light on Venus, i. 101; his Catalogue of Nebulæ, ii. 500.

Descartes, R., his account of the invention of the telescope, ii. 293.

Desvignoles, his account of a conjunction of the planets recorded by the Chinese, i. 70.

Dew-cap, ii. 243.

Dewar, Prof., his spectroscopic observations, ii. 370.

D'Hombre Firmas, observes the Sun's

corona during a partial eclipse, i. 281. Dhurmsala meteorite, ii. 371.

Diagonal eye-piece, ii. 25, 267.

Dialling, ii. 444. Dialyte, ii. 17.

Diameter of the Sun and planets, i. 652. See also the several planets.

Diana (Minor Planet (78)), i. 658.

Diana, Image of, at Ephesus, perhaps an aërolite, i. 591.

Dichotomisation of Venus, i. 102; of the Moon, ii. 448.

Dido (Minor Planet (209)), 664.

Dien, Ch., his Atlas Céleste referred to, ii. 503, 504.

Diffraction grating, ii. 380. Diffraction rings, ii. 16.

Digges, L., his ideas on parallax, i. 386; his ideas on comets, i. 489; his allusions to lenses, ii. 292.

Digges, T., edits his father's book on Optics, ii. 292.

Digit, explanation of, i. 266.

Diké (Minor Planet (99)), i. 166, 658.

Diodorus, his idea of the Milky Way, iii. 112.

Diodorus Siculus, cited, i. 323, 324, 423. Diogenes Laërtius, records eclipses, i. 265.

Dion Cassius, his Historia Romana cited,

Dione (Minor Planet (106)), i. 660; (satellite of Saturn), i. 233, 234, 235.

Dionysian Period, ii. 459.

Dip of the horizon, correction for, to be applied to sextant observations, ii. 153. Dip-sector, ii. 168.

Direct motion of a comet, i. 405.

Distance, North Polar, ii. 447.

Diurnal inequality of the tides, i. 365; libration of the Moon, i. 120.

Di Vico, his observations of Venus, i. 99; his observations of Saturn's rings, i. 211.

Di Vico's Comet, i. 433; comets thought to be identical with it, i. 428, 430,

Doberck, W., his analysis of Struve's Binary's Stars, iii. 37.

Dollond, G., invents the achromatic telescope, ii. 14, 296.

Dollond, P., uses three lenses in forming an object-glass, ii. 296.

Domes for observatories, ii. 198.

Dominical letter, ii. 454

Domitian, Emperor of Rome, his death "announced" by an eclipse of the Sun, i. 280.

Donati's great comet of 1858, i. 57, 64, 410, 448.

Doppelmaier, J. G., his Atlas, ii. 502. Dorado (constellation), iii. 115, 171; the nebula 30 in, iii. 88.

Dörfel, suggests that the comet of 1680 moved in a parabolic orbit, i. 407.

Doris (Minor Planet (49)), i. 656.

Double-image micrometer, ii. 42. Double stars, iii. 28; but few known until Sir W. Herschel commenced his search for them, iii. 28; examples of, iii. 32; binary stars, iii. 33; labours of Sir J. Herschel and F. G. W. Struve, iii. 34; optical double stars, iii. 36; hints on the observation of, ii. 276; list of Catalogues of, ii. 495; nomenclature of, iii. 255.

Draco (constellation), iii. 114, 172; parallax of γ and σ in, iii. 10; the nebula 37 H. IV. in, iii. 80.

Draconic period, i. 264.

Draper, H., his spectroscopic researches. ii. 310, 386, 387.

"Draper Memorial," ii. 387, 414. Draper, J. W., his researches on the spectra of incandescent solids and liquids, ii. 305; his photographs of the

solar spectrum, ii. 388. Drawing of astronomical objects, hints on the, ii. 285.

Drebbel, an early purchaser of telescopes, ii. 293.

Dresda (Minor Planet (268)), i. 668.

Dreyer, J. L. E., his value of precession,

i. 375; his remarks on the comet of 1744, i. 411; his Catalogue of Stars, ii. 494; his description of the Dumb bell nebulæ, iii. 94; his Catalogue of Nebulæ referred to, iii. 96; ii. 502; on the designations of nebulæ, iii. 98; his paper on variable nebulæ, iii. 98; doubts the variability of Tuttle's nebula in Draco, iii. 102.

Driving-clock, drawing of one by Warner

and Swasey, ii. 77.

Drum domes for observatories, ii. 199. Du Bartas, his description of comets quoted, i. 396.

Dubhe (a Ursæ Majoris), iii. 230, 231. Dufour, C., his account of the twinkling

of stars, iii. 26.

Duillier, first observes the Moon's shadow during a total solar eclipse, i. 285. "Dumb-bell nebula," iii. 91.

Dunér, N. C., his spectroscopic survey of the Northern heavens, ii. 359; his Catalogue of Stars, ii. 498; his Catalogue of Stars by Spectra, ii.

Dunlop, J., observes the comet of 1825, i. 411; his Catalogue of Stars, ii. 465; his Catalogue of Nebulæ, ii. 500.

Dunn, S., his observations of the transit of Venus in 1769, i. 349.

Dupuis, C. F., on the origin of the Zodiac, iii. 15.

Du Séjour, A. P. D., his calculations respecting the duration of eclipses of the Sun, i. 267, 268; on the mass of comets, i. 401.

Dynamene (Minor Planet (200)), i. 664.

Dynamometer, ii. 23.

E.

Earth, i. 107; period, &c., i. 107; figure of, i. 107; the ecliptic, i. 108; the equinoxes, i. 109; the solstices, i. 109; diminution of the obliquity of the ecliptic, i. 109; the eccentricity of the orbit of, i. 110; motion of the line of apsides, i. 110; familiar proofs and illustrations of the sphericity of, i. 111; Foucault's pendulum experiment, i.112; Mädler's tables of the duration of day and night, i. 116; opinions of ancient philosophers as to the rotation of, i. 116; English mediæval synonyms, i. 116; the Zodiac, i. 116; mass, i. 117. Earth-shine, i. 135.

East wind, ball for observations of stars, ii. 276.

Easter, ii. 449; derivation of the name

doubtful, ii. 450; rules for determining it, ii. 450.

Eccentricity of a planet's orbit, i. 58, 61, 651.

Ecclesiastical calendar, ii. 449.

Echo (Minor Planet (62)), i. 656.

Eclipses, general outlines of, i. 261; theory of a solar eclipse, i. 262; theory of a lunar eclipse, i. 263; definitions, i. 261; position of the Moon's orbit in relation to the Earth's orbit, i. 262; consequences resulting from their being inclined to each other, i. 262; retrograde motion of the nodes of the Moon's orbit, i. 264; coincidence of 223 synodical periods with 19 synodical revolutions of the node, i. 264; known as the "Saros," i. 265; statement of Diogenes Laërtius, i. 265; illustration of the use of the Saros, i. 265; number of eclipses which can occur, i. 266; solar eclipses more frequent than lunar ones, i. 267; duration of annular and total eclipses of the Sun, i. 267; eclipses in England, i. 269.

Eclipses, Catalogue of, i. 334. Eclipses, History of, i. 321.

Eclipses of the Moon, i. 326; lunar eclipses of less interest than solar ones, i. 326; summary of facts connected with them, i. 327; peculiar circumstances noticed during the eclipse of March 19, 1848, i. 327; observations of Forster, i. 328; Wargentin's remarks on the eclipse of May 18, 1761, i. 328; Kepler's explanation of these peculiarities being due to meteorological causes, i. 328; Admiral Smyth's account of the successive stages of the eclipse of Oct. 13, 1837, i. 329; the eclipse of Jan. 28, 1888, i. 331; the eclipse of Sept. 2, 1830, as witnessed in Africa by R. and J. Lander, i. 332; Chaldæan observations of eclipses, i. 332; other ancient eclipses, i. 332; anecdote of Columbus, i. 333.

Eclipses of the Sun, i. 270; grandeur of a total eclipse, i. 270; how regarded in ancient times, i. 271; effects of the progress of science, i. 272; Indian customs, i. 272; effect on birds at Berlin in 1887, i. 272; solar eclipses may be partial, annular, or total, i. 273; chief phenomena seen in connexion with total eclipses, i. 273; change in the colour of the sky, i. 273; the obscurity which prevails, i. 274; effect noticed by Piola, i. 276; physical explanation, i. 276; Baily's Beads, i. 277; extract from Baily's original memoir, i. 278; probably due to irradiation, i. 277; supposed to have been first noticed by Halley in 1715, i. 279; his description, i. 279;

the corona, i. 280; hypothesis advanced to explain its origin, i. 280; probably caused by an atmosphere around the Sun, i. 280; first alluded to by Philostratus, i. 280; then by Plutarch, i. 281; corona visible during annular eclipses, i. 281; the red flames, i. 282; remarks by Dawes, i. 282; physical cause unknown, i. 283; first mentioned by Stannyan, i. 283; note by Flamsteed, i. 283; observations of Vassenius, i. 284; aspect presented by the Moon, i. 284: remarks by Arago, i. 285; eclipse of July 28, 1881, i. 286; observations by Airy, i. 286; by Hind, i. 287; by Lassell, i. 289; eclipse of March 15, 1858, i. 291; eclipse of July 18, 1860, observations by Airy, i. 285; observations of the red flames by Bruhns, i. 296; meteorological observations by E. J. Lowe, i. 298; eclipse of August 18, 1868, i. 303; observations by Col. Tennant and M. Janssen at Guntoor, i. 304; summary of results, i. 304; observations of Governor J. P. Hennessy and Capt. Reed, R.N., i. 305; eclipse of August 7, 1869, i. 307; observations in America by Prof. Morton and others, i. 307; summary of results, i. 308; eclipse of December 22, 1870, i. 308; English expedition in H.M.S. Urgent to Spain, i. 308; observations in Spain and Sicily, i. 308; eclipse of December 12, 1871, i. 309; observed in India, i. 309; eclipse of April 16, 1874, i. 314; summary by Mr. W. H. Wesley of the recent observations as to the physical constitution of the corona, i. 311; spectroscopic observations during, ii. 335; recorded in ancient history, i. 321; eclipse of 585 B.C., i. 321; eclipse of 557 B.C., i. 323; eclipse of 479 B.C., i. 323; eclipse of 431 B.C., i. 323; eclipse of 310 B.C., i. 324; allusions in old English chronicles to eclipses of the Sun, i. 325. Ecliptic, i. 108; obliquity of, i. 109; vari-

ation in, i. 374.
Edinburgh Observatory, equatorial reflector at, ii. 103.

Egeria (Minor Planet (13)), i. 654.

Egoroff, his spectroscopic researches as to the telluric lines, ii. 312.

Egyptian system of the universe described, i. 72.

Electra (Minor Planet (130)), i. 660.

Elements of a planetary orbit, i. 58; general summaries and tables of, i. 651, et seq.; of a cometary orbit, i. 403; of a binary star, i. 403.

Ellery, R. L. J., his observations of Mars

in 1862, i. 3; his Catalogue of Stars, ii. 493; his Catalogue of Stars by Spectra, ii. 505.

Ellicott, observes shooting stars in 1799, i. 617.

Ellipse, the properties of, i. 61, 401, 406. Elliptic nebulæ, iii. 73.

Elmer, the monk, anecdote of, relating to the comet of 1060, i. 488.

Elongation of planets, i. 55; of Mercury, i. 86; of Venus, i. 93.

Elsa (Minor Planet (182)), i. 664.

Elvins, A., researches on rainfall and Sun-spots, i. 37.

Elvira (Minor Planet (277)), i. 668.

Enceladus (satellite of Saturn), i. 232,

233, 234.

Encke, J. F., his discussion of the transit of Venus in 1769, i. 2; his observations of Saturn's rings, i. 211; his method of calculating the orbits of double stars, iii. 34.

Encke's Comet, distance of, i. 64, 400; available for determining the mass of Mercury, i. 89; general account of, i. 415, 416, 522-45 passim, 548; spectrum of, i. 425; measurements of, i. 483, 484. Engelhardt, B. von, his Catalogue of

Nebulæ, ii. 502; of Stars, ii. 409. Engelmann, R., his Catalogues of Double Stars referred to, ii. 499; iii. 318.

Engelmann, W., his Catalogue of Double Stars, ii. 499.

England and the Gregorian Calendar, ii. 427, 429; constellations visible in, iii. 244.

Ensisheim aërolite, i. 594.

Eos (Minor Planet (221)), i. 666.

Epact, ii. 458, 465.

Epicycles, theory of, favoured by Copernicus, i. 73.

Equation, annual, of the Moon, i. 121. Equatorial instrument, ii. 64; its principle, ii. 64; Lord Crawford's plan for converting an altazimuth into an equatorial, ii. 65; two forms in general use, ii. 67; description of Sisson's form, and of the different accessories to the instrument generally, ii. 67; description of Fraunhofer's form, ii. 71; in what its superiority consists, ii. 71; types of modern equatorials of English, German and American manufacture, ii. 72; portable mountings, ii. 78, 93; Erck's window equatorial, ii. 93; the starfinder, ii. 95; mountings for reflectors, ii. 103; universal equatorial, ii. 104; the adjustments six in number, ii. 111; method of performing them, ii. III; method of observing with the instrument, reading the circles, &c., ii. 115; examples, ii. 116.

Equatorial stands, ii. 64; English form, ii. 67, 198; German form, ii. 71, 198; "Coudé" form, ii. 109.

Equinoxes, i. 109; iii. 15; precession of, i. 374; definitions of, i. 375.

Equuleus (constellation), iii. 114, 174.

Erato (Minor Planet (61)), i. 656.

Eridanus (constellation), iii. 115, 175; the nebula 26 H IV. in, iii. 80.

Erigone (Minor Planet (163)), i. 662.

Espin, T. E., his photographic catalogue of stars, ii. 405; his analysis of variable stars, iii. 51; his Catalogue of Stars by Spectra, ii. 505.

Establishment of the port, i. 364; ii. 448. Eucharis (Minor Planet (181)), i. 664.

Euctemon and Meton, their estimate of the length of the day, ii. 423.

Eudora (Minor Planet (217)), i. 666.

Eudoxus, his estimate of the length of the day, ii. 423.

Eugenia (Minor Planet (45)), i. 656.

Eukrate (Minor Planet (247)), i. 668.

Euler, L, his proposal for a compound object-glass, ii. 296.

Euneke (Minor Planet (185)) i. 664.

Eunomia (Minor Planet (15)), i. 654.

Euphrosyne (Minor Planet (31)), i. 654.

Europa (name suggested for one of the satellites of Jupiter), i. 185; (Minor Planet (53)), i. 656.

Eurydice (Minor Planet (75)), i. 658.

Eurykleia (Minor Planet (195)), i. 664.

Eurynome (Minor Planet (79)), i. 658.

Euterpe (Minor Planet (27)), i. 654.

Eva (Minor Planet (164)), i. 662.

Evection of the Moon, i. 120.

Everest, Sir G., his form of theodolite, ii. 165.

Eye, pupil of, ii. 244.

Eye-and-ear transits of stars, ii. 135. Eye-pieces, ii. 13, 18, 244; the positive eye-piece, ii. 18; the negative eyepiece, ii. 19; formulæ for calculating the focal lengths of equivalent lenses, ii. 20; Kellner's eye-piece, ii. 20; the Barlow lens, ii. 21; the terrestrial eye-

piece, ii. 21; the pancratic terrestrial

eye-piece, ii. 22; Grubb's prismatic terrestrial eye-piece, ii. 23; Ramsden's dynamometer, ii. 23; Berthon's dynamometer, ii. 23; Dawes's rotating eye-piece, ii. 25; Dawes's solar eye-piece, ii. 26, 267; Hilger's solar eye-piece, ii. 37; the polarising solar eye-piece, ii. 38; Airy's eye-piece for atmospheric dispersion, ii. 29; table of, for object-glasses of various apertures, ii. 244; hints on the use of, ii. 289.

F.

Fabricius, D., discovers the spots on the Sun, i. 44; observes the variable star Mira Ceti, iii. 44.

Fabry's comet of 1886, its colour, i. 399.

Faculæ on the Sun, i. 45, 53.

Fallows, F., his observations of η Argus, iii. 47; his Catalogues of Stars, ii. 489, 491.

Faye's periodical comet, i. 415, 429, 529-546, 548.

Fedorenko, I., his Catalogue of Stars, ii.

Felicitas (Minor Planet (109)), i. 660.

Ferguson, J., his remarks on the Harvest Moon quoted, i. 135.

Feronia (Minor Planet (71)), i. 658.

Ferrer, J. J., observes the solar eclipse of 1806, i. 275; observes irregularities in the Moon's surface during a solar eclipse, i. 285.

Festing, his researches in meteorological

spectroscopy, ii. 316.

Festivals, ecclesiastical, ii. 449.

Fides (Minor Planet (37)), i. 166, 656. Field of view of telescope, measuring the

diameter of, ii. 17. Fievez, C., his map of the solar spectrum,

ii. 384. "Finder" of a telescope, ii. 50, 243. Finlay's periodical comet, i. 415, 428.

Fireballs, i. 601; general description of them, i. 601; fireball of Nov. 12, 1861, i. 601; monthly table of apparitions, i. 603; dates of greatest frequency, i. 603; results of calculations with reference to them, i. 604; fireball of Oct. 19, 1877, i. 605; fireball of Nov. 13, 1888, i. 606.

Firmicus, J., perhaps alludes to the red flames seen during solar eclipses, i. 283.

Fixed stars, iii. 1.

Fizeau, H., his value for the velocity of light, i. 198.

Flames, Red, i. 7, 17, 282; spectroscopic observations of, ii. 328.

Flammarion, C., suggests a trans-Neptunian planet, i. 260; his rule as to stars visible by object-glasses of given aperture, ii. 246.

aperture, ii. 246.
Flamsteed, Rev. J., observes Uranus as a fixed star, i. 244; his remarks on the Red Flames, i. 284; his Catalogue of Stars referred to, iii. 122; his Atlas, ii.

Flaugergues, discovers the great comet

of 1811, i. 446.

Fletcher, I., observes Mimas with a 9-inch refractor, ii. 271; his Catalogue of Double Stars, ii. 496.

Flight, Dr. W., his Catalogue of Aërolites

referred to, i. 596.

Flora (Minor Planet (8)), i. 654.

Focal length of eye-pieces, ii. 19, 20. Focus required for Sun-spots, i. 15.

Focussing of telescopes, ii. 245. Fomalhaut (a Piscis Australis), iii. 214;

a star of the 1st magnitude, iii. 4, 11; colour of, iii. 39.

Fontenelle, B. Le B., his remarks on the proper motion of a Aquilæ, iii. 23.

Forbes, G., his speculations respecting a trans-Neptunian planet referred to, i. 260.

Forbes, Prof. J. D., observes the solar eclipse of 1842, i. 270; observes the Moon's shadow during a total solar eclipse, i. 285.

Forms for use in an observatory, ii. 287. Fornax Chemica (constellation), iii. 116,

117.

Forster, I. M. T., his observations of the lunar eclipse of 1848, i. 328; observes the transit of Mercury of 1848, i. 342; observes the August meteors in 1811, i. 620.

Fortuna (Minor Planet (19)), i. 654.

Foucault, L., his pendulum experiment to show the Earth's rotation, i. 112; his reflecting telescope, ii. 9; his "Helioscope," ii. 267; his early spectroscopic researches, ii. 305.

Foundations for an observatory, ii. 196. Frankland, Dr. W., his spectroscopic re-

searches, ii. 307.

Fraunhofer, J., invents the ring micrometer, ii. 43; his investigations on the solar spectrum, ii. 302; his "Lines," ii. 302; seen reversed, ii. 330.

Freia (Minor Planet (76)), i. 658.

French names of the constellations, iii.

Frigga (Minor Planet (77)), i. 658.

Fritsch, his researches as to Auroras, i. 35; observes a round black object on the

Sun, i. 78; observes the transit of Mercury of 1802, i. 342. Frodoard, his Chronicle cited, i. 590.

G.

Gadbury, J., his ideas on comets, i. 489. Galatea (Minor Planet (74)), i. 658.

Galaxy, iii. 105. See Milky Way. Galilean telescope, ii. 18; magnifying

power of, ii. 20.

Galileo, discovers the spots on the Sun, i. 44; his anagram on Venus, i. 105; discovers the Moon's libration, i. 120; discovers the phases of Mars, i. 149; discovers the satellites of Jupiter, i. 183; suggests observations of Jupiter's satellites for determining the longitude, i. 197; his observations of Saturn, i. 206; his logogriph sent to Kepler, i. 207; his views on the tides, i. 373; makes telescopes, ii. 293.

Galle, J. G., his observations of Saturn's rings, i. 212; note on his drawing of Saturn, i. 217; discovers Neptune, i. 255; his Catalogue of Comets, ii.

505.

Gallet, his observations of Saturn, i. 221. Gallia (Minor Planet (148)), i. 662.

Gambart, discovers a comet afterwards known as Biela's, i. 431.

Ganot, his Physics cited, i. 7.

Ganymede (name suggested for one of the satellites of Jupiter), i. 185.

Garumna (Minor Planet (180)), i. 664.

Gassendi, P., his explanation of Kepler's failure to see Mercury, i. 91; his drawings of Saturn referred to, i. 207; observes the transit of Mercury of 1631, i. 341; his unsuccessful endeavours to observe the transit of Venus of 1631, i. 346; witnesses the fall of an aërolite, i. 595; his opinions as to the origin of aërolites, i. 595.

Gaubil, Jesuit missionary at Pekin, his account of Chinese comets, i. 551.

Gauss, C. F., his *Theoria Motus Corporum Cælestium* referred to, i. 406; his method of finding Easter, ii. 452.

Gautier, A., discovery by, relating to the magnetic needle, i. 28; Sun-spots and

weather, i. 36.

Gemini (constellation), iii. 114, 178; radiant point of meteors in, i. 614, 623, 642; star R in, spectrum of, ii. 364; the nebulous star 45 H IV. in, iii. 82. See under "Castor," and "Pollux."

Geography, much mixed up with astronomy, i. 111.

George III. King of England, his relations with Sir W. Herschel, i. 243; despatches an expedition to observe the transit of Venus in 1769, i. 348.

Georgium Sidus, name proposed for Ura-

nus, i. 243.

Gerda (Minor Planet (122)), i. 660.

German names of the constellations, iii. 119.

Germania (Minor Planet (241)), i. 666.

Gill, D., his value of the Sun's parallax, i. 4; photographs the Great Comet of 1882, ii. 403.

Gilliss, J. M., observes η Argûs, iii. 48; his Catalogue of Stars, ii. 493.

"Girdle of the sky," an old English name for the ecliptic, i. 116.

Gladstone, Dr. J. H., his spectroscopic researches on the Sun, ii. 34.

Glaisher, J., his observations of the solar eclipse of 1858, i. 291.

Gledhill, his Catalogue of Double Stars, ii. 498.

Globular clusters, list of, iii. 62.

Gnomons, ii. 422, 445.

Goad, J., an old English writer, his humorous description of Mercury, i. 91.

Golden Number, ii. 457.

Goldschmidt, H., discovers several minor planets, i. 169; observes at an attic window, ii. 288.

Goodricke, observes the variable star Algol, iii. 45; discovers the variability

of δ Cephei, iii. 45.

Gould, B. A., his Catalogue of Stars, ii. 494; his observations of the great nebula in Argo, iii. 104; his *Uranometria Argentina* commented on, iii. 120.

Graham, A., uses the square bar micro-

meter, ii. 44.

Grant, R., his account of the discovery of Neptune referred to, i. 255; his statement respecting the discovery of Halley's comet in 1758, i. 439; his remarks on the Central Sun hypothesis, iii. 24; his estimate of the number of the stars visible to the naked eye, iii. 118; his Glasgow Catalogue of Stars, ii. 494.

Granules, solar, i. 50.

Gravier, Coulvier, summary of his observations of shooting stars, i. 608.

Gravitation, theory of, as applicable to Jupiter's satellites, i. 194; as applied to binary stars, iii. 34.

Great Britain, eclipses visible in, i.

269.

Greek Church, still uses the unreformed Calendar, ii. 428.

Greek year, ii. 436.

Green, J., his Atlas, ii. 502.

Green, N. E., his observations of Venus, i. 101; his observations of Mars, i. - 148; comparisons by him between refractors and reflectors, ii. 242; his observations of Saturn, ii. 271.

Greenwich Observatory, 30-feet dome at, ii. 237; Star Catalogues formed at, ii. 491, 492, 493, 494; photographic work

at, iii. 396.

Greg, R. P., his Catalogue of Aërolites referred to, i. 596; his observations of shooting stars referred to, i. 608,

Gregorian telescope, ii. 2; Calendar, ii. 424.

Gregory, J., suggests the use of transit observations for ascertaining the solar parallax, i. 339; invents the telescope which bears his name, ii. 2, 294.

Gregory VII., Pope, fixes the commencement of the Cycle of the Indiction, ii.

459.

Gregory XIII., Pope, his reform of the

Calendar, ii. 425. Gresham College, Hooke's place of observation, i. 383.

Griesbach, W., observes Jupiter without visible satellites, i. 195.

Grimaldi, notes the position of Jupiter's satellites, i. 174.

Grimthorpe, Lord, his explanation of transits of inferior planets, i. 338.

Grinding of mirrors, ii. 10, 12.

Gronemann, his ideas respecting the Zodiacal Light, i. 147.

Groombridge, S., his Catalogue of Circumpolar Stars, ii. 490.

Grosse's planisphere, iii. 252.

Grote, G., his History of Greece cited, i.

Grubb, Sir H., optician at Dublin, his terrestrial eye-piece, ii. 23; his duplex micrometer, ii. 36; equatorials by, ii. 72 et seq.; his twin equatorial, ii. 103; his method of adjusting equatorials referred to, ii. 117; large telescopes by, ii. 297.

Gruithuisen, F. von P., observes the transit of Mercury of 1832, i. 342.

Grus (constellation), iii. 115, 180. Guillemin, A., his account of the tides, i. 165; his explanation of parallax referred to, i. 384; his remarks on the Moon in the horizon, i. 391; his remarks on the distribution of nebulæ,

Guthrie, observations of Venus, i. 101.

Hadley, perhaps discovers Saturn's dusky ring, i. 212; invents the sextant, ii. 149.

Hakluyt's Voyages cited, i. 44.

Hall, A., discovers the satellites of Mars, i. 159; observes a spot on Saturn, i. 205; on the orbit of Hyperion, i. 234; on the orbits of Saturn's satellites, i. 287; his Catalogue of Double Stars, ii. 499; his diagram of & Lyræ, and note thereupon, iii. 41.

Hall, C. M., investigates the rotation of Neptune, i. 258; makes refracting

telescopes, ii. 296.

Halley, E., suggests finding the Sun's distance by transits of Venus, i. 2; detects the acceleration of the Moon's mean motion, i. 121; investigates eclipses, i. 266; his account of the solar eclipse of 1715, i. 273; first observes Baily's Beads, i. 279; observes the transit of Mercury of 1677, i. 341; brings about the publication of Newton's Principia,, i. 437; makes reflecting telescopes, ii. 295; his Catalogue of Stars, ii. 488; his Catalogue of Nebulæ, ii. 500; suspects the variability of stars in Argo, iii. 47.

Halley's comet, i. 437; extent of its orbit, i. 400, 438; drawn on the Bayeux Tapestry, i. 443; measurement of, in 1835, i. 483; elements of, 512-528

passim, 548.

Hammond, Captain, observes shooting

stars in 1832, i. 617.

Hansen, P. A., his opinions respecting the Sun's parallax, i. 4; his investigations on the Moon's motions, i. 121; his Tables of the Moon, i. 140; his Tables of the Sun cited, ii. 426.

Hansteen, C., his investigations relating

to the magnetic needle, i. 35.

Harding, K. L., observes the transit of Mercury of 1799, i. 341; observes the transit of Mercury of 1832, i. 342; his Atlas, ii. 502.

Hardy's noddy, ii. 212.

Harkness, W., his photographs of the solar eclipse of 1878, i. 316; his remarks on transits of planets cited, i. 338; on making models of cometary orbits, i.

Harmonia (Minor Planet (40)), i. 656.

Harriot, T., discovers the spots on the Sun, i. 44; uses a telescope, ii. 293.

Harris, J., predicts in 1729 that telescopes will not be further improved, i. 234.

Harvard Photometry cited, iii. 12, 120.

Harvest Moon, i. 135.

Hasselberg, B., his review of the spectroscopic observations of certain comets, ii. 344.

Hasselgren, observes the solar eclipse of 1851, i. 287.

Hastings, his spectroscopic researches, ii.

Hatt, his observations of the transit of

Venus in 1882, i. 354.

Haze, stars seen through, ii. 275, 289; Saturn's dusky ring discovered during ii. 284.

Hearne, optician in London, makes reflecting telescopes, ii. 295.

Heat rays of the Sun, i. 43; of the Moon, i. 138; of the Stars, iii. 21.

Heather, J. F., his Mathematical Instru-ments cited, ii. 165.

Hebe (Minor Planet (6)), i. 654.

Hecate (Minor Planet (100)), i. 658.

Hecuba (Minor Planet (108)), i. 660.

Hedda (Minor Planet (207)), i. 664.

Heinsius, G., denies that the comet of 1744 exhibited phases, i. 409.

Heis, E., his observations of shooting stars referred to, i. 608; his Neuer Himmels Atlas referred to, ii. 264, 504.

Helena (Minor Planet (101)), i. 658.

Heliometer, ii. 177.

Helium, new metal supposed to have been found in the Sun by Frankland, ii. 333. Hell, M., forms the constellation of Psalterium Georgianum, iii. 117.

Helmert, F. R., his value of the velocity

of light, i. 380.

Hencke, K. C., resumes the search for Minor Planets, i. 168.

Henderson, T., observes Encke's comet in 1832, i. 418; his Catalogues of Stars, ii. 490.

Hennessy, Sir J. P., his observations of the solar eclipse of 1868, i. 305.

Henrietta (Minor Planet (225)), i. 666.

Henry I. King of England, his death mentioned by William of Malmesbury,

Henry, King of France, his death preceded by a comet, i. 488.

Henry, MM., their observations of Saturn's rings, i. 230; their observations of Saturn's belts, i. 246, 248; their photographs of stars, ii. 405, 406; of the Pleiades, ii. 406.

Hera (Minor Planet (103)), i. 658.

Hercules (constellation), iii. 114, 181;

advance of the solar system towards, iii. 24; cluster 13 M in, iii. 64; cluster 92 M in, iii. 65.

Hermione (Minor Planet, (121)), i. 660.

Herodotus, his History cited, i. 322, 323,

Herrick, E. C., his observations of shoot-

ing stars, i. 621.

Herschel, Sir W., suggestions by, as to influence of Sun-spots on weather, i. 36; his theory of Sun-spots, i. 40; his estimate of the brightness of the different parts of a Sun-spot, i. 43; large facula observed by, i. 46; considered that there was a difference between the two hemispheres of the Sun, i. 53; his observations of Mercury, i. 87, 88, 89; his observations of Venus, i. 98, 99; his observations of Mars, i. 148, 156, 158; his observations of snow-patches on Mars, i. 156; his observations of Ceres, i. 166; thinks the minor planets fragments of a large planet, i. 167; his value for Jupiter's rotation, i. 181; infers the actual rotation of Jupiter's satellites, i. 195; his strange idea as to the shape of Saturn, i. 203; ascertains the period of Saturn's rotation, i. 205; obtains indications of an atmosphere on Saturn, i. 205; his observations on the divisions in Saturn's ring, i. 208; infers the rotation of Saturn's rings, i. 220; on the form of Saturn's rings, i. 228; suggests that an atmosphere surrounds Saturn's rings, i. 229; observes a transit of Titan's shadow across Saturn, i. 238; his discovery of Uranus, i. 242; his observations of Uranus, i. 244; imagines the existence of a ring round Uranus, i. 246; his remarks on the axis of Uranus, i. 246; discovers two satellites of Uranus, i. 248; notes a peculiar circumstance connected with them, i. 249; his opinion that comets shine by their own inherent light, i. 409; sees no phase in the comet of 1807, i. 410; his observations of the comet of 1811, i. 446; his form of reflecting telescope, ii. 5; his observations on the solar spectrum, ii. 388; his Catalogues of Stars, ii. 489, 495, 497, 498; his Catalogues of Nebulæ, ii. 500; his table of the comparative brilliancy of stars, iii. 4; his inquiry as to the proper motions of stars, iii. 23; suggests stars which may be centres of systems, iii. 25; discovers binary stars, iii. 31, 33; reputed changes in the colours of certain stars observed by, iii. 39; studies the variable star Mira Ceti, iii. 45; misses a star in Hercules, iii. 57; invents the name

Planetary Nebula, iii. 76; his classification of nebulæ, iii. 96; notes the enormous number of stars in the Milky Way, iii. 109; his Stratum Theory of the Milky Way, iii. 109; Proctor suggests that he abandoned it, iii. 110.

Herschel, Sir J. F. W., his remarks on the matter on the Sun, i. 6; his estimate of the Sun's heat, i. 7; his remarks on the distribution of Sun-spots, i. 10; believed one hemisphere of the Sun to be hotter than the other, i. 43; his discussion of Kepler's Laws referred to, i. 61; his remarks on suspected lunar volcano, i. 126; doubts the existence of a lunar atmosphere, i. 134; on the heat of the Moon, i. 138; his idea as to the Moon's influence in dispersing clouds, i. 141; his opinion as to the Zodiacal Light, i. 143; on the cause of the colour of Mars, i. 150; his remarks on the Minor Planets, i. 167; his account of the phases of Saturn's rings referred to, i. 219; his estimate of the thickness of Saturn's rings, i. 222; his ideas as to the surfaces of Saturn's rings, i. 228; on the orbits of Saturn's satellites, i. 234; his test for the observation of Uranus's satellites, i. 248; his observations of the lunar eclipse of 1837, i. 329; his account of nutation, i. 378; his statement of refraction referred to, i. 387; his explanation of the dilated size of the Sun and Moon seen near the horizon, i. 391; watches Biela's comet pass in front of a cluster of stars, i. 414; his observations of the comet of 1861, i. 458; notes the radiant point of shooting stars in Camelopardus, i. 621; his scale of star magnitudes mentioned, ii. 281; recommends the use of cardboard discs, ii. 285; his observations on the solar spectrum, ii. 388; his Catalogues of Stars, ii. 495, 496; his Catalogues of Nebulæ, ii. 500, 501; on the light of Sirius, iii. 5; his remarks on the stars, iii. 18; remarks on the proper motion of stars, iii. 22; his labours as to double stars, iii. 28; list of double stars selected as tests, iii. 31, 32; his method of calculating the orbits of double stars, iii. 34; his remark on isolated coloured stars, iii. 37; his observations of η Argus, iii. 47; his remarks on temporary stars, iii. 56; misses a star in Virgo, iii. 57; his description of the annular nebula in Lyra, iii. 69; his drawing of the great nebula in Andromeda, iii. 73; his description of the spiral nebula 51 M Canum Venaticorum, iii. 74; his description of the cluster 47 Toucani, iii. 83; of the "Crab nebula" in Taurus, iii. 86; of the great nebula in Orion, iii. 86; of the nebula η Argûs, iii. 88, 103; of the cluster & Crucis, iii. 89; of the cluster & Centauri, iii. 90; of the cluster 20 M Sagittarii, iii. 90; of the cluster 8 M Sagittarii, iii. 90; of the nebula 27 M Vulpeculæ, iii. 92; of the Nubeculæ Major and Minor, iii. 94; distribution of the nebulæ included in his general Catalogue, iii. 95; symbols to represent his Catalogues, iii. 96; abbreviations used by, iii. 97; scales of brightness, size and form used by, iii. 98; his description of the Milky Way, iii. 105; his estimate of the total number of stars, iii. 109; his letter to Miss Herschel on void spaces in Scorpio, iii. III; his comments on the constellations, iii. 117; his proposed reform of the constellations, iii. 120.

Herschel, A.S., his account of the meteorite of 1881, i. 597; his calculations as to fire-balls, i. 604; his observations of shooting stars referred to, i. 608; his observations of shooting stars in 1872,

i. 623.

Herschel, Colonel John, his observations of the great nebula in Argo, iii. 104.

Herschel, Miss C, the second discoverers

Herschel, Miss C., the second discoverer of Encke's comet, i. 416; note by, on spaces in Scorpio void of stars, iii. 110. Herschelian telescope, ii. 5.

Hersilia (Minor Planet 206), i. 664.

Hertha (Minor Planet (135)), i. 660.

Hesiod, Theogonia, quotation from, i. 116.

Hesperia (Minor Planet (68)), i. 656.

Hestia (Minor Planet (46)), i. 656.

Hevelius, J., discovers the Moon's libration in longitude, i. 119; pays much attention to the Moon, i. 139; observes the transit of Mercury of 1661, i. 341; observes the comet of 1652, i. 410; his Cometographia referred to, i. 550; his Catalogue of Stars, ii. 488; his Atlas, &c., ii. 502; observations of Mira Ceti, iii. 44.

High water, found by means of an almanac, ii. 448.

Hilda, (Minor Planet (153)), i. 165, 166, 662.

Hind, J. R., his statement of planetary characteristics, i. 57; his account of the orbit of Donati's comet, i. 57; his remarks on the planet Vulcan, i. 78, 80; on the alleged satellite of Venus, i. 104;

his account of the Moon's motions quoted, i. 120; his account of the Moon's mountains cited, i. 128; his observations of Vesta and Victoria, i. 166; his remark on Jupiter's axial rotation, i. 182; his account of the phases of Saturn's rings cited, i. 219; favours the idea of change in Saturn's rings, i. 227; his elements of 2 of Uranus's satellites, i. 250; his elements of Neptune's satellite, i. 259; investigates solar eclipses visible in England, i. 269; observes the solar eclipse of 1851, i. 237; his note on future solar eclipses, i. 336; criticises Pastorff's claim to have seen a comet cross the Sun, i. 414; his treatise on Comets referred to, i. 434; his observations of the comet of 1861, i. 461; his calculations respecting the tail of Coggia's comet, i. 474; his Catalogues of Comets referred to, i. 551; his Atlas, ii. 503; his Catalogues of Comets, ii. 505; his remarks on the colour of variable stars, iii. 50; his statement of the place of Tycho Brahe's star, ii. 55; observes a temporary star in Ophiuchus, iii. 55; observes a nebula in Taurus suspected to be variable, iii. 99; suspects nebulosity about some of the stars in the Pleiades, iii. 103.

Hindu astronomy. i. 17, 207, 271; cele-

bration of an eclipse, i. 271.

Hints on Astronomical Observations at, ii. 242; on the choice of instruments, ii. 242; eye-pieces, ii. 244; areas of object-glasses and mirrors, ii. 249; on cleaning lenses and mirrors, ii. 248; on the choice of stands, ii. 250; clockwork, ii. 251; the parallactic ladder, ii. 252; observing-box, ii. 257; Steinheil's transit-prism, ii. 259; sidereal time indicator, ii. 260; useful books, ii. 263; how to observe the Sun, ii. 266; the Moon, ii. 269; the planets, ii. 270; hints as to Venus, i. 95; sweeping for objects, ii. 273; comets, clusters, and nebulæ, ii. 274; drawing nebulæ, ii. 274; stars, including double stars, ii. 275; triangular star discs, ii. 276; observations of stars for colour, ii. 278; magnitudes of stars, ii. 280; observations of variable stars, ii. 283; miscellaneous hints, ii. 283; lights in an observatory, ii. 283; clothing for an observer, ii. 284; number of nights available in a year, ii. 285; aperture of object-glass may sometimes be reduced with advantage, ii. 285; forms to facilitate work at the telescope, ii. 286; hints by Admiral Smyth, ii. 286,

Hipparchus, suspects the lunar evection, i. 120; discovers precession, i. 377; his estimate of the length of the day, ii. 423; observes a temporary star, iii. 54; origin of his Catalogue, iii. 54.

Hippisley, on the position of Saturn's

rings, i. 228.

History of the telescope, ii. 291; of astronomy, sketch of, ii. 468.

Hitchins, his observation of the transit of

Venus in 1769, i, 349.

Hodgson, R., observes an explosion on the Sun, i. 32.Hodgson, Rev. W., his paper on the

Prismatic Transit referred to, ii. 260. Hofmann, K. F., completes Kirchoff's

map of the spectrum, ii. 379.

Holden, E. S., his observations of Saturn, i. 204; note by, respecting the discovery of Uranus, i. 243; his observations of the compound nucleus of the Great Comet of 1882, i. 481; hints on drawing nebulæ, ii. 275; his account of the annular nebula in Lyra, iii. 69; his account of the planetary nebula, 37 H IV. Draconis, iii. 80; his account of the nebula 17 M Scuti Sobieskii, iii. 91.

Holwarda, Phocylides, discovers the vari-

ability of o Ceti, iii. 44.

Homer, in the *Iliad* mentions Venus, i. 104; in the *Odyssey* mentions the Pleiades and Hyades, iii. 59.

Honoria (Minor Planet (236)), i. 666.

Hooke, R., first observes spots on Jupiter, i. 176; his note on the luminosity of Saturn, i. 222; his efforts to detect stellar parallax, i. 382; invents the zenith-sector, ii. 168; invents the siderostat, ii. 181; makes the first reflecting telescope, ii. 295.

Hooke's joint, ii. 52.

Hopkins, B. J., his observations of the Great Comet of 1882, i. 476.

Horizon, i. 383.

Horizon, artificial, ii. 155. Horizontal parallax, i. 284.

Horizontal parallax, i. 384. Horne and Thornthwaite's star-finder, ii. 95; Steinheil's transit prism, ii. 259.

Hornstein, O., his opinion as to the Minor Planets, i. 170.

Horologium (constellation), iii. 116, 183. Horrebow, C., suggests the periodicity of Sun-spots, i. 25.

Horrox, Rev. J., observes the transit of

Venus of 1639, i. 346. "Horse-shoe" nebula, iii. 91.

Hough, G.W., his observations of Jupiter, i. 179; his Catalogue of Stars, ii. 499. Hour-circle, ii. 69, 105.

Hours, ii. 430.

Houzeau, J. C., his account of the Milky Way referred to, iii. 105; his Atlas, ii. 504.

Howard, L., describes the aërolite of 1795, i. 595.

Howe, H. A., his Catalogue of Stars, ii.

Howlett, Rev. F., his observations of Sunspots, i. 15; his method of viewing them by projection, ii. 267, 268.

Huberta (Minor Planet (260)), i. 668.

Huggins, W., his summary of phenomena seen on the Sun, i. 50; observes the transit of Mercury of 1861, i. 343, see also i. 345; his lecture on the theory of comets referred to, i. 413; his spectroscopic researches, ii. 307, 328; his researches on solar prominences, ii. 331; his account of the spectrum of the corona, ii. 336; observes spectroscopically an occultation of a star by the Moon, ii. 339; his spectroscopic observations on the planets, ii. 341; his spectroscopic observations of nebulæ, ii. 369; his observations of the motions of stars in the line of sight, ii. 372; iii. 24; his photographs of the spectra of stars, iii. 385; his experiments on stellar radiant heat, iii. 21; his spectroscopic observation of the annular nebula in Lyra, iii. 69.

Humboldt, A. Von, his ideas as to the Moon's weather influences, i. 141; his observations of the Zodiacal Light, i. 143, 145; his observations of shooting stars in 1799, i. 616; his account of Tycho Brahe's star, iii. 54.

Hunniades, the Hungarian general, i.

488.

Hunter's Moon, the, i. 136. Hussey, Rev. T., suggests a planet beyond Uranus, i. 253. Huth, his observations of Encke's comet

in 1805, i. 416.

Huygens, C., notices snow-patches on Mars, i. 156; his logogriph respecting Saturn's ring, i. 207; observes the transit of Mercury of 1661, i. 341; presents a telescope to the Royal Society, ii. 294; invents the negative eye-piece, ii. 18, 294. Hyades, the, in Taurus, iii. 61.

Hydra (constellation), iii. 115, 184; the nebula 27 H IV. in, iii. 80.

Hydrus (constellation), iii. 115, 186. Hygeia (Minor Planet (10)), i. 654.

Hygre (tidal phenomenon), i. 371. Hygrometer, as an adjunct to an obser-

vatory, ii. 220.

Hypatia (Minor Planet (238), i. 666. Hyperbola, properties of, i. 401, 406. Hyperbolic comets, i. 368. Hyperion (satellite of Saturn), i. 233, 234, 237.

I.

Ianthe (Minor Planet (98)), i. 658.

Iapetus (satellite of Saturn), i. 233, 237; observations of, by Cassini and Sir W. Herschel, i. 240.

Ibrahim Ben-Ahmed, Sultan of the Arabs, falling stars seen at the death

of, i. 615.

Ida (Minor Planet (243)), i. 666.

Ideler, L., his Handbuch der Chronologie referred to, ii. 460.

Idunna (Minor Planet (176)), i. 664.

Illumination of wires, ii. 37, 39, 123. 284.

Ilse (Minor Planet (249)), i. 668.

Inclination of the ecliptic, i. 374; of a planet's orbit, i. 58.

Indentations, apparent, in the limb of the Sun, i. 18, 42.

Index error of an equatorial, ii. 112; of a transit instrument, iii. 134; of a sextant, ii. 152.

Indian astronomy, i. 271.

Indicator for the planets devised by I. Roberts, ii. 273.

Indiction, ii. 458. Indus (constellation), iii. 115, 186. Inequality, parallactic, of the Moon, i. 120; diurnal, of the tides, i. 365.

Inferior planets, i. 54.

Ino (Minor Planet (173)), i. 662.

Instruments, astronomical, iii. 1. See the several instruments.

Intra-Mercurial planets, i. 75, 81.

Io (name suggested for one of the satellites of Jupiter), i. 185; (Minor Planet (85)), i. 658.

Iphigenia (Minor Planet (111)), i. 660.

Irene (Minor Planet (14)), i. 654.

Iris (Minor Planet (7)), i. 654.

Irma (Minor Planet (177)), i. 664.

Iron, meteoric, i. 590.

Isabella (Minor Planet (210)), i. 664.

Isaiah xiv. 12, cited, i. 490.

Isis (Minor Planet (42)), i. 656.

Ismene (Minor Planet (190)), i. 165, 664.

Isolda (Minor Planet (211)), i. 666.

Istria (Minor Planet (138)), i. 664.

Izarn, his Des Pierres Tombées du Ciel · cited, i. 592.

J.

Jacob, Captain W.S., regards the so-called division in Saturn's exterior ring as merely a depression, i. 211; his measures of Saturn, i. 222; elements of Saturn's satellites, i. 237; his Catalogues of Stars, ii. 490, 492; his Catalogue of Double Stars, ii. 496, 497; an observer of double stars, iii. 35

"Jacob's Ladder," an old name of the

Milky Way, iii. 111.

Jahn, G. A., his Catalogue of Comets, ii. 505.

Jamieson, A., his Atlas, ii, 502.

Jansen, Z., one of the inventors of the telescope, ii. 292.

Janssen, J., his photographs of the Sun, i. 51; his observations of the solar eclipse of 1868, i. 304; his observations of the solar eclipse of 1870, i. 308; his observations of the solar eclipse of 1883, i. 318; his spectroscopic researches, ii. 311; his method of taking solar photographs, ii. 395; his photographs of the Sun, ii. 400.

Jeaurat, his diagram of the Pleiades, ii. 59, 60.

Jedrzejewicz, his Catalogue of Stars, ii.

Jehangir, Emperor of Hindustan, his sword made of meteoric iron, i. 591.

Jenkins, his summary of the observations of Mercury's transits, i. 344.

Jewish year, ii. 436. Job, ix. 9 cited, iii. 15; xxxviii. 31-2 cited, iii. 15.

Johanna (Minor Planet (127)), i. 660.

Johnson, M. J., speech on awarding medal to Schwabe, i. 25; his rule as to stars visible with object-glasses of given aperture, ii. 246; his Catalogue of Stars, ii. 490, 492.

Johnson, Rev. S. J., his Eclipses Past and Present referred to, i. 269, 321; on the appearance of the Moon during a lunar eclipse, i. 329.

Johnston, A. K., his account of the tides,

i. 370; his Atlas of Astronomy referred to, ii. 264.

Jones, Felix, his identification of Nimrud and Mosul, i. 323.

Jones, Rev. G., his observations of the Zodiacal Light, i. 144.

Jude, St., 13, cited, i. 490.

Juewa (Minor Planet (139)), i. 660.

Julia (Minor Planet (%)), i. 658.

Julian Calendar, ii. 426; period, ii. 459. Juno (Minor Planet (3)), i. 166, 187, 654.

Jupiter, period, &c., i. 173; subject to a slight phase, i. 174; its belts, i. 174; their physical nature, i. 175: first observed by Zucchi, i. 176; dark spots, i. 176; luminous spots, i. 177; the great red spot, i. 178; the great white spot, i. 178; Hough's observations, i. 179; alleged connection between spots on Jupiter and spots on the Sun, i. 181; axial rotation of Jupiter, i. 181; centrifugal force at its equator, i. 182; luminosity of Jupiter, i. 182; its apparent motions, i.183; astrological influences, i. 183; attended by 4 satellites, i. 183; application of Kepler's third law to the satellites of, i. 60; are they visible to the naked eye, i. 183; Table of them, i. 185; eclipses of the satellites, i. 186; occultations, i. 187; transits, i. 188; peculiar aspects of the satellites when in transit, i. 188; singular circumstance connected with the interior ones, i. 192; instances of all being invisible, i. 194; variations in their brilliancy, i. 195; observations of eclipses for determining the longitude, i. 197; practical difficulties, i. 197; Römer's discovery of the progressive transmission of light, i. 197; mass of Jupiter, i. 198; the "Great Inequality," i. 198; Tables of Jupiter, i. 199; occultation of, i. 358; its influence on comets, i. 400, 401, 429, 439; hints on observations of, ii. 272; of its satellites, ii. 340; spectrum of, ii. 340.

Justin, his History cited, i. 324. Justitia (Minor Planet (269)), i. 668,

K.

Kaiser, F., investigates the rotation of Mars, i. 158.

Kalends, Greek, ii. 438.

Kater, Captain W., his floating collimators, ii. 170; his observations of Saturn's rings, i. 211; his mercurial clepsydra,

Keeler, his observations of Saturn at the Lick Observatory, i. 230; his remarks on the power of telescopes, ii. 247.

Kellner's eye-piece, ii. 20.

Kepler, his laws, i. 57; the second, i. 58, 491; the third, 59, 77; his anticipation of new planets, i. 67; the foundation of Newton's theory of gravitation is 60 to the test of the conditions. tation, i. 60; treats of the Zodiacal Light, i. 144; suggests that Mars has satellites, i. 162; mentions the solar eclipse of 1590, i. 274; observes the Red Flames during a partial eclipse of the Sun, i. 284; notes the ruddy hue of the Moon during eclipses of the Sun, i. 284; his observations of the lunar eclipse of 1598, i. 329; predicts the transit of Mercury of 1631, i. 341; his Rudolphine Tables, i. 345; predicts the transit of Venus of 1631, i. 345; observes an occultation of Jupiter, i. 359; indicates that gravitation influences the tides, i. 373; changes in the Great Comet of 1618 noticed by, i. 483; suggests a telescope of two convex lenses, ii. 294.

Kesselmeyer, his opinion on the origin of

aërolites, i. 595.

Kew, photoheliograph, ii. 396.

Key, Rev. H. C., observes Encke's Comet in 1871, i. 422; makes reflecting telescopes, ii. 9; his observations of the nebulous star 45 H IV. Geminorum,

Khandrikoff, his drawing of the solar eclipse of 1887, i. 320.

Kirch, verifies an ancient Chinese con-

junction of planets, i. 70.

Kirchhoff, his spectroscopic researches, ii. 303, 327; his map of the spectrum, ii. 379; his experiments with the spec-

trum of iron, ii. 308.

Kirkwood, D., on the longitude of Sunspots, i. 13; his treatise on the Minor Planets referred to, i. 165; coincidences with respect to the satellites of Saturn, i. 238; suggests some connection between certain comets, i. 435; his researches as to the November meteors, i. 631; his theory that meteors are fragments of comets, i. 634; his theory of temporary stars, iii. 57.

Klein, H. J., his Atlas (London ed., S.P.C.K.) referred to, ii. 264, 504; his Astronomische Objecte für gewöhnliche Telescopen referred to, ii. 504.

Klinkerfues, investigates the orbit of

Biela's comet, i. 433.

Köhler, suggests a symbol for Uranus, i. 243.

Kolgo (Minor Planet (191)), i. 664.

Königsberg Observatory, heliometer at

the, ii. 177. Konkoly, N. Von, his treatise on Astronomical Instruments referred to, ii.192; his treatise on Astronomical Photography referred to, ii. 416; the equatorial reflector at his observatory, ii. 105; his remarks on the spectra of meteors, ii. 350; his spectroscopic survey of the Southern heavens, ii. 359.

Kriemhild (Minor Planet (242)), i. 666. Krüger, A., his Catalogue of Stars, ii. 494.

Labaume, B., his Catalogue of Double

Stars, ii. 496.

La Caille, N. L., his Catalogues of Stars, ii. 488, 490; his Catalogue of Nebulæ, ii. 500; his nomenclature of the constellation Argo, iii. 17; observes η Argûs, iii. 47; adds to the number of the constellations, iii. 116, 117.

Lacerda, his observations of Venus, i. 96. Lacerta (constellation), iii. 116, 187; radiant point of meteors in, i. 640.

Lachesis (Minor Planet (120)), i. 660.

Lacrimosa (Minor Planet (208)), i. 664.

Ladder for use in observatories, ii. 217; parallactic, ii. 252.

"Ladye's Way," an old English name for the ecliptic, i. 117.

Laërtius, Diogenes, records the number of eclipses observed in Egypt, i. 265.

Lætitia (Minor Planet (39)), i. 656.

Lagging of the tides, i. 363.

La Hire, G. P., his observations of Venus, i. 99; his suggestion as to the cause of the corona, i. 280; his explanation of certain phenomena seen during occul-

tations, i. 357. Lalande, J. J. Le F. De, on the orbit of Iapetus, i. 237; infers the existence of an unseen planet, i. 253; observes Neptune as a fixed star, i. 259; his Table of Transits of Venus cited, i. 340; his theory as to phenomena seen during transits of Venus, i. 349; his Catalogue of Stars, ii. 489; adds to the number of the constellations, iii. 117.

Lamb, his translation of Aratus cited, iii.

Lamb, Miss A. M., her Catalogue of Stars, ii. 495.

Lambert, J. H., passage in his Lettres

Cosmologiques suggesting binary stars. referred to, iii. 33.

Lamberta (Minor Planet (187)), i. 664.

Lameia (Minor Planet (248)), i. 668.

Lamont, J., discovery by, relating to the magnetic needle, i. 28; his observations of Tethys, i. 232; observes Neptune as a fixed star, i. 259; his Catalogue of Stars, ii. 492, 493; his Catalogue of Nebulæ, ii. 500.

Lander, African explorer, observes an

eclipse of the Moon, i. 332.

Landgrave of Cassel, his revolving dome,

ii. 198.

Langley, S. P., his estimate of the Sun's heat, i. 7; his observations of solar spots, i. 8; his experiments on the Moon's heat, i. 138; his observations of the transit of Venus in 1882, i. 353; his instrument called the Bolometer, ii. 389.

Lansberg, P. Van, his Tables of Venus, i.

346.

La Nux, observes the comet of 1769, i. 411. La Place, P.S. De, on the relative brightness of the Sun's surface, i. 43; on the ancient observations of Mercury, i. 91; partially investigates the Moon's motions, i. 121; on Jupiter's satellites and the law of gravitation, i. 194; calculates the rotation of Saturn's rings, i. 220; on the week, ii. 433; on the origin of zodiacal constellations, iii. 16.

Lardner, D., his Astronomy referred to,

ii. 265.

Larissa, eclipse of, i. 322.

Lassell, W., his observations of Venus, i. 101; his observations of the Zodiacal Light, i. 143; his observations of Jupiter, i. 175, 177, 190, 195; his observations of Saturn's rings, i. 211; observes the dusky ring of Saturn, i. 212; on the colour of Saturn's rings, i. 228; suspects the existence of mountains on Saturn's rings, i. 228; notes the dull colour of the rings, i. 231; his observations of Hyperion, i. 234; observes the satellites of Uranus, detecting one of them, i. 248, 249; discovers the satellite of Neptune, i. 258; observes the solar eclipse of 1851, i. 276, 289; his drawing of Jupiter being occulted by the Moon, i. 358; his reflector presented to the Greenwich Observatory, ii. 237; on the management of specula, ii. 250; his opinion on Newtonian reflectors, ii. 270; his Catalogue of Nebulæ, ii. 501; investigates the alleged changes in the great nebula in Argo, iii. 104.

L'Astronomie (French magazine) referred

to, ii. 263.

Latitude, to find, ii. 140, 156; aspect of the celestial sphere varies with, i. 112;

ii. 446; iii. 118, 239.

Laugier, P. A. E., his value of the duration of the Sun's axial rotation, i. 14; investigates the early history of Halley's comet, i. 443; his Catalogue of Nebulæ,

Laurentia (Minor Planet (162)), i. 662.

Laussedat, A., observes the horns of the solar crescent during eclipse truncated, i. 285.

Layard, Sir A. H., his identification of Larissa and Mespila, i. 323; discovers at Nimrud a plano-convex lens, ii. 291.

Leap-year, peculiarity of, ii. 435.

Leda (Minor Planet (38)), i. 656.

Ledger, Rev. E., his summary of the Intra-Mercurial Planet Controversy cited, i. 79; his remarks on the satel-lites of Mars, i. 161; his lecture on Twinkling referred to, iii. 26.

Lee, Dr. J., observes a star projected on the Moon, i. 356; his Meridian Circle,

ii. 148.

Le Monnier, P. C., observes Uranus as a fixed star, i. 244; anecdote of, related by Arago, i. 244.

Lenses of eye-pieces, ii. 18.

Leo (constellation), iii. 115, 188; radiant point of meteors in, i. 623; orbit of meteors in, i. 628, 630, 631, 633, 635. Leo Minor (constellation), iii. 116, 190.

Lepus (constellation), iii. 115, 190. Lescarbault, Dr., his supposed discovery of an Intra-Mercurial planet, i. 75.

Lespiault, G., his remarks on the similarity of the orbits of the Minor Planets Fides and Maia, i. 166.

Leto (Minor Planet (69)), i. 656.

Leucothea (Minor Planet (35)), i. 654.

Levander, F. W., observes the satellites of Jupiter with the naked eye, i. 184.

Level, striding, ii. 119. Levels, tests for, ii. 130.

Le Verrier, U. J. J., his investigations into the theories of the planets, i. 3; his investigation into the theory of Mercury, i. 75, 81; his interview with Lescarbault respecting Vulcan, i. 76; tests some Chinese observations of Mercury, i. 90; his Tables of Venus, i. 106; on the eccentricity of the Earth's orbit, i. 110; his Tables of Mars, i. 163; his estimate of the mass of the minor planets, i. 166; his Tables of Jupiter, i. 199; his Tables of Saturn, i. 241; his connection with the planet

Neptune, i. 253; his investigations of the orbit of Faye's comet, i. 429; unsuccessfully searches for a variable nebula in Taurus, iii. 100.

Lewis, Sir G. C., his Astronomy of the

Ancients cited, ii. 437.

Lewis, H. C., remarks on solar storms, i. 32.

Lexell, first announces Uranus to be a planet, i. 243; his comet, i. 400, 521.

Liais, E., artillery projectiles on the Sun, i. 6; disputes the discovery of Vulcan, i. 79; claims to have seen a double. comet, i. 409.

Liandier, his remarks on Twinkling, iii.

Liapounov, M., his observations on the Great Nebula in Orion referred to, iii.

Liberatrix (Minor Planet (125)), i. 660.

Libra (constellation), iii. 115, 191; what it might symbolise, iii. 15; cluster 5 M in, iii. 63.

Libration of the Moon, i. 119, 137; photographs of, taken at Oxford, ii. 402.

Libussa (Minor Planet (264)), i. 668.

Lichtenberg, G. C., suggests Astræa as a name for Uranus, i. 243.

Lick Observatory, ii. 238, 247; photographic methods used at, ii. 396.

Light, transmission of, i. 197; aberration of, i. 380; progressive velocity of, i.

Lihou, his observations of Venus, i. 95.

Lilæa (Minor Planet (213)), i. 666.

Limits, ecliptic, i. 263.

Lindenau, B. Von, suggests that the diameter of the Sun is liable to change, i. 5; his Tables of Venus, i. 105; his Tables of Mars, i. 163; his value of the constant of aberration, i. 381.

Lindsay, Lord, his observations of the solar eclipse of 1870, i. 308; his observations of the solar eclipse of 1871, i. 309, 313; his suggestion respecting transits of Venus, i. 345. See also "Crawford, Earl of."

Lippersheim, H., one of the inventors of

the telescope, ii. 292. Little, Dr., observes the transit of Mer-

cury of 1881, i. 344.

Littrow, C. Von, his suggestion as to the minor planets, i. 165; his Atlases, ii. 503, 504; his estimate of the number of the stars visible to the naked eye,

Liveing, E. H., his portable star-finder referred to, ii. 106; his spectroscopic observations, ii. 370.

Lockyer, J. N., description of the phases of Saturn's rings, i. 239; his division of the stars into groups, ii. 360; his spectroscopic researches, ii. 307; his work at South Kensington, ii. 322; his theory of basic lines, ii. 325; his observations of the spectra of meteorites, ii. 351; his classification of the spectra of stars, ii. 360.

Logarithm books for the use of amateurs, ii. 265; use of, in connection with the transit instrument, ii. 139; use of, in computations for finding the latitude,

ii. 157.

Logogriphs on Venus, i. 105; on Saturn, i. 207.

Lohrmann, W. G., his map of the Moon, i. 139.

Lomia (Minor Planet (117)), i. 660.

Longitude, mean, of a planet, i. 58. Loomis, E., on the periodicity of Sunspots, i. 31; his Practical Astronomy referred to, ii. 1, 129, 266; his light

curve of η Argús, iii. 48. Loomis, L. W., his observations of an occultation of Saturn, i. 359.

Loreley (Minor Planet (165)), i. 662.

Louis XIV., telescope made for, by Campani, ii. 294.

Louville, Red Flames seen by, in 1715, i.

Low water, found by means of an almanac, ii. 448.

Lowe, E. J., his observations of the comet of 1861, i. 462; his observations of shooting stars in 1872, i. 623. Löwer, Sir W., suggests that comets may

move in ellipses, i. 407.

Löwy, M., his observations on the Sun in association with De La Rue referred to, i. 34; his period for Donati's comet, i. 457.

Lubbock, Sir J. W., his paper on tides referred to, i. 361.

Lubienitzki, S., his Theatrum Cometicum referred to, i. 550.

Lucia (Minor Planet (222)), i. 666.

Lucifer, the classical name of Venus, i. 104.

Lucina (Minor Planet (146)), i. 662. Lucretia (Minor Planet (281)), i. 870.

Lucretius, his ideas as to the stars, iii. 18; his ideas as to a Central Sun, iii. 25.

Luculi on the Sun, i. 46.

Lumen (Minor Planet (141)), i. 660.

Lumière cendrée, on the Moon, i. 135 on Venus, i. 101.

Lummis, his observations of some object on the Sun, i. 77.

Lundahl, G., his value of the co-efficient of nutation, i. 378; his value of the constant of aberration, i. 381.

Luni-solar precession, i. 375, 376. Lupus (constellation), iii. 115, 192.

Lutetia (Minor Planet (21)), i. 654.

Luther, E., his observations of the supposed variable nebula in Scorpio, iii. ICI.

Luther, R., discovers Minor Planets, i. 168, 654, 656, 658.

Lydia (Minor Planet (110)), i. 166, 660.

Lynn, W. T., his remarks on certain constellations, iii. 115.

Lynx (constellation), iii. 116, 194.

Lyra (constellation), iii. 114, 195; annular nebula in, iii. 69; radiant points of meteors in, i. 623, 640; orbit of meteors in, i. 631; the multiple star e in, iii. 28, 40, 41.

M.

McClean's star spectroscope, ii. 184. Macculloch, his account of the Tides in Scotland cited, i. 371.

Mackay, his observations of η Argûs, iii.

Maclaurin, C., observes Baily's Beads at an annular eclipse, i. 279; observes the Red Flames during an annular eclipse, i. 284.

Maclear, Sir T., notes a strange incident connected with Jupiter's IInd satellite, i. 189; his observation of an occultation of Aldebaran in 1831, i. 357; his value of the constant of aberration, i. 381; his Catalogues of Stars, ii. 493, 494; his observations of

η Argûs, iii. 47. Macrobius, his Comment. in Somnium Scipionis cited, i. 116.

Madan, names the satellites of Mars, i. 160.

Mädler, J. H., his value of Venus's horizontal refraction, i. 100; Table of length of day by, i. 116; his observations on the snow-patches on Mars, i. 156; ascertains the time of Mars's rotation, i. 158; ascertains the time of Jupiter's rotation, i. 181; measures the ellipticity of Uranus, i. 244; his Catalogue of Stars, ii. 491; of Double Stars, 496, 497; investigates the Central Sun hypothesis, iii. 24.

Magellanic clouds, iii. 94.

Magnetism, terrestrial, and solar spots,

Magnitude of the solar system, popular illustration of, i. 63.

Magnitude of stars, iii. 3; subdivisions of, iii. 3; list of stars of the 1st magnitude, iii. 3; of all the stars visible to the naked eye, iii. 125; Comparative Table of, ii. 282.

Mahomet II., Sultan of Turkey, i. 488.

Mahometan year, ii. 438.

Maia (Minor Planet (66)), i. 165, 656;

(one of the Pleiades), iii. 59.

Maimonides, his statement as to Sabian

astrologers, i. 490. Main, Rev. R., his measures of Saturn referred to, i. 203, 222; his value of the constant of aberration, i. 381; his Cata-

logues of Stars, ii. 490, 492, 493. Malmesbury, William of, mentions the solar eclipses of 1133 and 1140, i. 325. Manilius, his description in the Astronomicon of the Milky Way cited, iii.

Maps, astronomical, ii. 264, 502; Berlin Star, i. 166; iii. 503.

Maps of the spectrum, ii. 379; Kirchhoff's map of the solar spectrum, iii. 379; advantages of a diffraction grating, iii. 380; Angström's normal spectrum, iii. 381; wave-lengths of the principal Fraunhofer lines, iii. 382; reduction of measures, iii. 383; maps of the spectrum, iii. 384; Rowland's photographs, iii. 384; the ultra-violet spectrum, iii. 385; Huggins's photographs of stellar spectra, and of the spectra of nebulæ and comets, iii. 385; fluorescence, iii. 388; the infra-red spectrum, iii. 388; phosphorescence, iii. 388; Abney's photographs of the infra-red, iii. 389; entire range of the spectrum, iii. 389.

Maraldi, J. P., notices snow-patches on Mars, i. 156; his observations on the ansæ of Saturn's rings, i. 222; confirms the variability of Algol, iii. 45.

Mardokempadius, lunar eclipse during the reign of, i. 332.

Maria, or Myrrha (Minor Planet (170)), i.

Marié-Davy, his experiments on the Moon's heat, i. 138.

Marius, S., fraudulently claims to have discovered the satellites of Jupiter, i. 183.

Markab (a Pegasi), iii. 207; perhaps the centre of a system, iii. 25.

Mars, use of, for determining the Sun's

parallax, i. 2; Ellery's observations of, i. 3; application of Kepler's third law to the satellites of, i. 59; period, &c., i. 148; phases, i. 149; apparent motions, i. 149; its brilliancy, i. 150; telescopic appearance, i. 150; its ruddy hue, i. 150; Schiaparelli's "Canals," i. 152; general statement of the physical details of, i. 152; map of, on Mercator's projection, i. 153; polar snow, i. 154; axial rotation, i. 158; its seasons, i. 158; its atmosphere, i. 159; its satellites, i. 159; ancient observation of, i. 162; spectroscopic observations of, ii. 339; spectroscopic observations of, ii. 339.

Marth, A., discovers a Minor Planet, i. 168, 654; his Catalogue of Nebulæ, ii.

501.

Martha (Minor Planet (205)), i. 664.

Martin, Dr., watches a fish during the solar celipse of 1858, i. 293.

Mascaret, the, on certain French rivers,

i. 373.

Maskelyne, Rev. N., observes Uranus soon after its discovery, i. 242; his method of recording transits of stars, ii. 135; his Catalogue of Stars, ii. 488. Mason's hygrometer, useful in an observ-

atory, ii. 220.

Mason, C., observes the satellites of Jupiter with the naked eye, i. 183.

Mass of the Sun, i. 5, 652; of the planets, i. 652; of comets, i. 400; and see the several planets.

Massilia (Minor Planet 20), i. 165, 654.

Matilde (Minor Planet (253)), i. 668.

Maunder, E. W., observations of Sunspots, i. 15; his photographs of the solar eclipse of 1886, i. 319; his spectroscopic researches on Sunspots, ii. 317; his spectroscopic observations of Tebbutt's comet, ii. 346.

Maurice, T., his Indian Antiquities

cited, i. 207.

Maurice, Prince of Nassau, had a telescope presented to him in 1610, ii. 293.

Maximilian, Archduke, Scheiner shows him a telescope, ii. 295.

Maximilian, Emperor of Germany, and the aërolite of Ensisheim, i. 594.

Mayer, T., his map of the Moon, i. 139; observes Uranus as a fixed star, i. 244; his Catalogue of Stars, ii. 488.

Mazzaroth, probable meaning of, iii. 15. Mean distance of a planet, i. 58, 61. Mean longitude of a planet, i. 58.

Mean Moon, ii. 419.

Méchain, P. F. A., the first discoverer of Encke's comet, i. 416; discovers the planetary nebula 97 M Ursæ Majoris, iii. 79.

Medea (Minor Planet (212)), i. 665.

Mediterranean Sea, the tides in, i. 367. Medium, Resisting, i. 419, 425.

Medusa (Minor Planet (149)), i. 165, 662.

Melbourne Observatory, the great equatorial at, ii. 106.

Melete (Minor Planet (47)), i. 656.

Melibœa (Minor Planet (137)), i. 660.

Melloni, M., on the heat of the Moon, i. 138.

Melpomene (Minor Planet 18), i. 654.

Menippe (Minor Planet (188)), i. 664.

Menkab (a Ceti), iii. 158; perhaps the centre of a system, iii. 25.

Mercator, G., observes the transit of Mercury of 1661, i. 341.

Mercury, apparent movements of, between 1708 and 1715, i. 57; period, &c., i. 86; phases, i. 86; physical observations by Schröter, Sir W. Herschel, Denning, Schiaparelli and Guiot, i. 87; when best seen, i. 88; determination of its mass, i. 89; acquaintance of the ancients with, i. 90; Copernicus and, i. 91; Le Verrier's investigations as to the motions of, i. 75, 81, 91; Tables of, i. 92; spectroscopic observations of, ii. 339.

Meridian, how to find it, ii. 195, 444.

Meridian circle, ii. 147.

Meridian mark, ii. 206.

Mersenne, suggests the reflecting telescope, ii. 294.

Merz, optician at Munich, large telescopes by, ii. 297.

Messer, J., his Atlas, ii. 504.

Messier, observes the rapid changes in the comet of 1769, i. 413; forms the well-known Catalogue of Nebulæ which bears his name, ii. 500; iii. 96; reprint of many of the entries in it, iii. 262.

Meteoric astronomy, i. 589; suggested connection between Meteors and Sun-

spots, i. 36.

Meteorological instruments for observa-

tories, ii. 220.

Meteors, theory of, i. 626; are planetary bodies, i. 626; their periodicity, i. 627; meteoric orbits, i. 628; researches of Newton, i. 628; of Adams, i. 629; orbit of the meteors of November 13, i. 629; identity of the orbits of comets and meteors, i. 630; the meteor showers of November 13 and 27, i. 634; recent progress of meteoric astronomy, i. 635;

table of the chief radiant points of, i.

639; spectra of, ii. 350.

Meteors, telescopic, i. 644; our knowledge of them limited, i. 644; observations, i. 644; probable heights in the atmosphere, i. 645; showers of, i. 646; summary of Prof. Safarik's observations and deductions, i. 647; fireball observed in a telescope on October 19, 1863, i. 650.

Metis (Minor Planet (9)), i. 654.

Metius, A., his connection with the invention of the telescope, ii. 293.

Meton, length of the day stated by, ii. 423; invents the cycle which bears his name, ii. 457. Metonic Cycle, ii. 457, 462.

Metrodorus, his idea of the Milky Way, iii. II2.

Michelson, A., his value of the velocity

of light, i. 380.

Micrometers, ii. 30; the reticulated, ii. 30; the parallel-wire, ii. 32; the position, ii. 34; measurement of angles of position, ii. 35; Grubb's duplex, ii. 36; bright-wire, ii. 37; Bidder's, ii. 37; Burnham's, ii. 39; the double image, ii. 42; the ring, ii. 43; the square-bar, ii. 44.

Microscopium (constellation), iii. 116, 197. Middleton, J., his Celestial Atlas, ii. 503. Milky Way, iii. 105; its course amongst the stars described by Sir J. Herschel, iii. 105; the "Coal Sack" in the Southern hemisphere, iii. 108; remarks by Sir W. Herschel as to the prodigious number of stars in the Milky Way, iii. 109; computation by Sir J. Herschel of the total number of stars visible in an 18inch reflector, iii. 109; Sir W. Herschel's "Stratum Theory," iii. 109; void spaces in the heavens, iii. 111; terms applied to the Milky Way by the Greeks, iii. III; by the Romans, iii. II2; by our ancestors, iii. 113; planetary nebulæ in, iii. 81.

Miller, Prof. W. H., his early spectro-

scopic researches, ii. 305.

Milner, Rev. T., his Gallery of Nature

cited, ii. 618.

Milton, J., Paradise Lost, his allusion to comets, i. 489; his allusion to Astarte, ii. 450; his description of the Milky Way, iii. 113.

Mimas (satellite of Saturn), i. 232, 233,

Minerva (Minor Planet (93)), i. 658.

Minor Planets, i. 164; sometimes called Ultra-Zodiacal Planets, i. 164; summary of facts, i. 165; notes on Ceres, i. 165, 166; Pallas, i. 165, 166; Juno,

i. 165, 166; Vesta, i. 165, 166; Olbers's theory, i. 167; history of the search made for them, i. 167; independent discoveries, i. 168; progressive diminution in their size, i. 169; is the Zodiacal Light connected with them? i. 144; Table of, i. 654.

Mira (o) Ceti, ii. 368; iii. 43.

Miriam (Minor Planet (102)), i. 658.

Mirrors of telescopes, Browning's method of mounting, ii, 10.

Mitchell, J., conjectures the existence of binary stars, iii. 33.

Mitchell, O. M., his Catalogues of Stars, ii. 498.

Mnemosyne (Minor Planet (57)), i. 656.

Model of a comet's orbit, i. 403. Moesta, C. W., his remarks on rock

foundations for observatories, ii. 196; his Catalogue of Stars, ii. 492. Möstlin, observes an occultation of Mars

by Venus, i. 360; his enumeration of the stars in the Pleiades, iii. 59.

Moll, G., observes the transit of Mercury of 1832, i. 342; see also i. 345. Molyneux, W., observes Jupiter without

visible satellites, i. 195; makes a reflecting telescope, ii. 295.

Monck, W. H. S., on the appearance of the Moon during a lunar eclipse. i. 329; his review of the photometric results of Pickering and Pritchard, iii. 13.

Monoceros (constellation), iii. 116, 197. Mons Mensæ (constellation), iii. 116, 196.

Montaigne, suspects a satellite of Venus, i. 103.

Montanari, discovers the variability of Algol, iii. 45; his note on the disappearance of stars in Argo, iii. 57.

Montbaron, suspects a satellite of Venus, i. 103.

Months, ii. 435; derivations of the names of, ii. 437; verse giving number of days in, ii. 435; Jewish, ii. 436; Roman, ii. 437; Mahometan, ii. 438; French Revolutionary, ii. 440.

Montigny, C., his researches on Twink-

ling, iii. 26.

Moon, i. 118; period, &c., i. 118; its phases, i. 119; its motions and their complexity, i. 119; libration, i. 119; evection, i. 120; variation, i. 120; parallactic inequality, i. 120; annual equation, i. 121; secular acceleration, i. 121; diversified character of the Moon's surface, i. 123; lunar mountains, i. 124; seas, i. 124; craters, i. 124; volcanic character of the Moon, i. 124; Bergeron's experiment, i. 125;

the lunar mountain Aristarchus, i. 127; Teneriffe, i. 128; lunar atmosphere, i. 128; researches of Schröter, &c., i. 133; Hansen's curious speculation, i. 134; the Earth-shine, i. 135; the Harvest Moon, i. 135; astronomy to an observer of the Moon, i. 137; luminosity and calorific rays, i. 138; historical notices as to the progress of lunar chartography, i. 139; lunar Tables, i. 140; meteorological influences, i. 140; influence of, on the tides, i. 362; transit observations of, ii. 136; general observations of, ii. 269; spectrum of, ii. 339; spectrum of eclipsed Moon, ii. 340; photograph of, ii. 401. Moonlight, brightness of, i. 138.

Morton, Prof., his observations of the solar eclipse of 1869, i. 307.

Mossotti, O. F., discovers Encke's comet in 1832, i. 418.

Motion of the San in the ecliptic, ii. 419; of the stars through space, ii. 372.

Motions of the planets, i. 138: of comets.

Motions of the planets, i. 138; of comets, i. 405.

Motions of the stars in the line of sight, spectroescopic observations of, ii. 373. Mouchez, E., his Catalogue of Stars, ii.

Mountains, suspected, on Venus, i. 99; on the Moon, i. 124; suspected on Saturn's ring, i. 228.

Mudge, T., makes reflecting telescopes, ii. 295.

Multiple stars, iii. 29, 40.

Mural circle, ii. 165. Murray, Sir W. K., observes luminous

spots on Jupiter, i. 177.

Musca Australis (constellation), iii. 117,
199.

N.

Nadir, definition of, ii. 549. Nairne, his observations of the transit of Venus in 1769, i. 349. Naked eye, number of stars visible to,

Naked eye, number of stars visible to, iii. 14, 109, 118; useful Catalogue of such stars, iii. 119.

Names of the stars, origin of, iii. 15.
Napoleon Buonaparte and Venus, i. 97;
and the comet of 1769, i. 489.

Narrien, Prof. J., his Astronomy and Geodesy cited, ii. 149, 165, 168.

Nasmyth, J., his observations of "Willow-leaves" on the Sun, i. 46; his labours as to the Moon's surface, i. 123, 140; his Newtonian telescope, ii. 9.

Nausikaa (Minor Planet (192)), i. 664.

Nautical Almanac, contains a list of occultations, i. 355; referred to, ii. 262, 263; commencement of, ii. 478.

Neap tides, i. 163.

Nebulæ, objects recorded as, which may have been comets, i. 588; spectroscopy as applied to, ii. 369; spectra of nebulæ, ii. 369; connection with meteorites, iii. 372; Catalogues of, ii. 500; account of, iii. 66; Sir J. Herschel's abbreviations, iii. 97; variable, iii. 99; list of, suitable for amateurs, iii. 261.

Nebulous stars, iii. 81.

Needle, magnetic, variation in the declination of, i. 28.

Negative eye-piece, ii. 19.

Neison, E., corrects Madler's and Lyman's values of Venus's horizontal refraction, i. 100.

Nemausa (Minor Planet (52)), i. 656.

Nemesis (Minor Planet (128)), i. 660.

Neptune, circumstances which led to its discovery, i. 252; summary of the investigations of Adams and Le Verrier, i. 253; telescopic labours of Challis and Galle, i. 264; the perturbations of Uranus by Neptune, i. 256; statement of these perturbations by Adams, i. 257; period, &c. of, i. 257; attended by I satellite, i. 258; elements of its orbit, i. 258; mass of Neptune, i. 259; observations by Lalande in 1795, i. 259; spectrum of, ii. 341.

New Stars, Catalogue of, iii. 332.

Newall, R. S., observes in 1859 a very large Sun-spot, i. 17; observes a flickering in the tail of Coggia's comet, i. 413.

Mewcomb, S., confirms Le Verrier as to the discordances in Mercury's orbit, i. 91; his value of the Earth's mass, i. 117; disputes certain conclusions of Hansen respecting the Moon, i. 134; his researches respecting the Minor Planets, i. 169; his Tables of Uranus, i. 251; his Tables of Neptune's satellite, i. 260; his opinion respecting the solar eclipse of 557 B.C., i. 323; his memoir on Solar Eclipses cited, i. 334; his memoir on Transits of Mercury cited, i. 340; his Catalogue of Stars, ii.

Newton, Sir I., his birthplace at Woolsthorpe, i. 74; explains the Moon's variation, i. 120; investigates the prophecies of Daniel, i. 332; explains the theory of tides, i. 373; discovers the cause of precession, i. 377; applies to the comet of 1680 his theory of gravitation, i. 437; invents the telescope which bears his

name, ii. 2, 295; his experiment on the composition of Sun-light, ii. 299. Newton, H. A., his investigation of the

November meteors, i. 628.

Newtonian telescope, ii. 2. Nice Observatory referred to, ii. 193.

Nicetas, of Syracuse, i. 116. Nicias, Athenian general, i. 333.

Nicolai, his value of the mass of Jupiter,

Niesten, L., his summary of the Minor Planets referred to, i. 165; his remarks on the light of Donati's comet, i. 410; his Catalogue of comets in order of Inclinations referred to, i. 511; his analysis of the colours of binary stars, iii. 38.

Niobe (Minor Planet (72)), i. 658.

Nitrogen gas, found in nebulæ, iii. 69. Noble, W., observations of Venus, i. 101; hints on observing the Sun, ii. 268.

Noddy, Hardy's, ii. 212.

Node, ascending, of the Sun, i. 15: of a planet's orbit, i. 58, 61; of the Moon's orbit, i. 264; of the Earth's orbit, i.

375. Nodical revolution of the Moon, i. 264.

Noon, mean, ii. 419.
"Noonstede Circle," old English name for the ecliptic, i. 117.

Norie, his method of determining the

time by the sextant, ii. 158.

Norma (constellation), iii. 116, 200. Northumberland equatorial at Cambridge, account of, referred to, ii. 69.

November meteors (Leonids), i. 627, 628,

630, 631, 632, 635, 643. Nubecula Major, iii. 88, 94. Nubecula Minor, iii. 94.

Nubian after-glow, i. 393.

Nucleus of a Sun-spot, i. 8; of a comet, i. 396.

Numa Pompilius, sacred shield of, perhaps an aërolite, i. 502.

Nutation, i. 377; the coefficient of, i. 378.

Nuwa (Minor Planet (150)), i. 662.

Nyrén, M., his value of the constant of aberration, i. 381.

Nysa (Minor Planet (44)), i. 656.

0.

Oberon (satellite of Uranus), i. 247. Object-glass, ii. 13, 243; list of large ones, ii. 296. Obliquity of the ecliptic, i. 109, 374.

Observing chairs, ii. 215.

Observatory, ii. 193; article on, in Enclyclopædia Britannica, referred to, ii. 193; introductory statement, ii. 193; the Bedford observatory, ii. 194; choice of a site, ii. 195; foundations, ii. 196; details of the structure of the observatory, ii. 196; the equatorial room, ii. 198; construction of domes, ii. 198; hemispherical dome, ii. 199; drum dome, ii. 199; polygonal dome, ii. 199; bearings for a dome, ii. 200; cannon balls, ii. 200; movement of a dome, ii. 201; transit room, ii. 203; transit room arrangements at Bedford, ii. 204; setting circles, ii. 206; meridian mark, ii. 206; observatory clocks, ii. 209; Hardy's noddy, ii. 212; chronograph, ii. 215; observing seats and chairs, ii. 215; Dawes's chair, ii. 215; Cooke's observatory ladder, ii. 217; ladder at the Dear-born Observatory, ii. 218; Knobel's ob-serving chair, ii. 219; meteorological instruments, ii. 220; plans and specifications for a 10-ft. observatory, ii. 221; adaptation of the same to a private house, ii. 227; the "Romsey" form of cheap observatory, ii. 229; plans and specifications of the same, ii. 230; the 30-ft. Lassell dome at the Royal Observatory, Greenwich, ii. 236; the Washburn Observatory, Madison, U.S., ii. 237; the Lick Observatory, Mount Hamilton, California, ii. 238; account of several important modern ones by Newcomb, referred to, ii. 296.

Observatory, magazine, referred to, ii.

263.

Occultations, i. 355; how caused, i. 355; Table annually given in the Nautical Almanac, i. 355; occultation by a young Moon, i. 356; effect of the horizontal parallax, i. 356; projection of stars on the Moon's disc, i. 356; occultation of Jupiter, January 2, 1857, i. 358; occultation of Saturn, May 8, 1859, i. 358; occultation of Saturn, April 9, 1883, i. 359; historical notices, i. 359.

Ocean, curvature of, i. 111.

Oceana (Minor Planet (224)), i. 666.

Octans (constellation), iii. 116, 200.

Enone (Minor Planet (215)), i. 666.

Enopides of Chios, his estimate of the length of the day, ii. 423.

Olbers, W., his speculations regarding the Minor Planets, i. 167; his remarks on vibrations in the tails of comets, i. 411; criticises Pastorff's claim to have seen a comet cross the Sun, i. 414; his periodical comet, i. 437, 524-5 passim; his memoir on the November meteors referred to, i. 624.

Olefiant gas, spectrum of, ii. 343.

Olmsted, D., his estimate of the period of auroras, i. 35; his statement on refraction quoted, i. 387; suggests the cometary character of the November meteors, i. 631.

Öltzen, W., his edition of Argelander's

Star Catalogue, ii. 491.

Olympia, allas Elpis (Minor Planet 6), i. 656.

Open-air observations, ii. 253, 263.

Opera-glass, ii. 18.

Ophelia (Minor Planet (171)), i. 662.

Ophiuchus (constellation), iii. 114, 201; Hind's Nova in, iii. 55.

Oppavia (Minor Planet (255)), i. 668.

Oppolzer, T. Von, his Catalogue of Eclipses cited, i. 334; his Lehrbuch zur Bahnbestimmung der Kometen und Planeten referred to, i. 406; his calculations respecting Winnecke's comet, i. 424.

Optical double stars, iii. 31, 35.

"Orbis lacteus," Latin name of the Milky Way, iii. 111.

Orbit-sweeper, ii. 177.

Orbits of planets and their elements, i. 58; of comets and their elements, i. 401; graphical process for determining, i. 491; of double stars, iii. 33; method

of calculating, iii. 34.

Orion (constellation), iii. 114, 203; the great nebula in, iii. 85, 86; its spectrum, ii. 386; radiant point of meteors in, i. 623, 642; referred to in the books of Job and Amos, iii. 15; the multiple star σ in, iii. 42; nebulous stars in, iii. 82.

Ovid, his description of the Milky Way,

iii. IO2.

Oxford *Uranometria* cited, iii. 12, 120. Oxygen, in the Sun, ii. 309.

P.

Pacific Ocean, the tides in, i. 368.

Pales (Minor Planet (50)), i. 656.

Palitzch, detects Halley's comet in 1758, i. 439; observes the variable star Algol, iii. 45.

Palladium of Troy, perhaps an aërolite, i. 591.

Pallas (Minor Planet (2)), i. 165, 166, 167, 654.

Pancratic terrestrial eye-piece, ii. 22. Pandora (Minor Planet (56)), i. 656.

Panopea (Minor Planet (70)), i. 656.

Pape, C. F., his drawings of Donati's comet, i. 449, 455.

Parabola, the, i. 401, 404, 406.

Paracelsus, his ideas on comets, i. 488. Parallactic inequality of the Moon, i. 120.

Parallactic ladder, ii. 252.

Parallax, its effect on occultations, i. 356, 383; explanation of its nature, i. 383; parallax of the heavenly bodies, i. 384; parallax of the Moon, i. 384; ii. 154; importance of a correct determination of the parallax of an object, i. 386; Leonard Digges on the distance of the planets from the Earth, i. 386; correction for, to be applied to sextant observations, ii. 153; parallax in altitude of the Sun, ii. 154.

Parallax, equatorial horizontal, of the Sun, i. 2; Stone's value of, i. 3; Winnecke's value of, i. 3; Gill's value of, i. 4; popular comparison of the amount of,

1. 4.

Parallax, stellar, photographic results, ii. 411; in the case of certain stars, iii. 6. Parallel wire micrometer, ii. 32, 248.

Paris Observatory, ii. 9, 109, 145, 147, 177. Paris Photographic Congress, ii. 409. Parklurst, his *Lexicon* referred to, iii. 15.

Parthenope (Minor Planet [17]), i. 654.
Pastorff, suspects that he saw a comet cross the Sun, i. 413.

Paulina (Minor Planet (278)), i. 668.

Pavo (constellation), iii. 115, 205.

Pearson, Rev. W., notes a strange incident connected with Jupiter's IInd satellite, i.189; his *Practical Astronomy* referred to, ii. 1, 164 et seq., 192; his refractor, ii. 253; his Catalogue of Stars, ii. 490.

Peek, C. E., his observations of the nebula

in Argo, iii. 104.

Peers, his photograph of the solar eclipse of 1878, i. 316.

Pegasus (constellation), iii. 114, 206; cluster 15 M in, iii. 65.

Peirce, B., supposes Saturn's rings to be fluid, i. 222.

Peitho (Minor Planet (118)), i. 660.

Pendulum experiments, i. 112; compensation pendulums for astronomical clocks, ii. 209; Challis's hints on the management of, ii. 210.

Penelope (Minor Planet (201)), i. 664.

Penrose, F. C., his graphical process for determining the orbit of a comet, i. 491.

Penthesilea (Minor Planet (271)), i. 668.

Penumbra, of a solar spot, i. 8; derivation of the word, i. 8; seen during eclipses of the Moon, i. 329.

Peri-astron passage of a binary star, i. 403. Pericles, anecdote of, during an eclipse, i.

Perigee, definition of, ii. 550; solar, its motion, i. 110, 467; daily motion of the Sun in, ii. 419.

Perihelion, Sun in, i. 8; derivation of the word, i. 57; longitude of, i. 58, 62, 403; distances of comets, i. 484; passage of a comet, i. 403.

Period, Dionysian, ii. 459; Julian, ii. 459.

Periodic comets, i. 415.

Periodic stars; see variable stars, iii. 43. Periodical publications relating to astronomy, ii. 263.

Periodicity of shooting stars, i. 640; of fireballs, i. 613.

Periods of the planets, i. 651; of comets, 1. 400.

Perrotin, J., his Catalogue of Double Stars, ii. 499; iii. 318.

Perry, Rev. S. J., his spectroscopic researches, ii. 321.

Personal equation, ii. 129; instrument, ii.

Perseus (constellation), iii. 114, 208; radiant point of meteors in, i. 623, 640, 642; orbit of meteors in, i. 630; cluster in the sword-handle of, iii. 62.

Perturbations, definition of, ii. 550; of Uranus by Neptune, i. 256.

Peters, C. A. F., his value of the secular variation in the obliquity of the ecliptic, i. 374; his value of precession, i. 376; his value of the coefficient of nutation, i. 378; his value of the constant of aberration, i. 381; his results as to stellar parallax, iii. 10; his researches as to the proper motions of stars, iii. 24.

Peters, C. H. F., sees a solar spot in a high latitude, i. 9; on peculiarities as to neighbouring spots, i. 24; criticises Lummis's observations alleged to be of Vulcan, i. 78; criticises Swift's and Watson's observations on the same subject, i. 85; discovery of minor planets by, i. 169, 658, 660, 662, 664, 666, 668; his short-period comet (1846, vi.), 434; his Zodiacal Charts, ii. 504.

Petit, F., his estimate of the depth of the Sun's atmosphere, i. 53.

Phædra (Minor Planet (174)), i. 662.

Phases, of an inferior planet, i. 55; of Mercury, i. 86; of Venus, i. 94; of the Moon, i. 119; mentioned in almanacs, ii. 448; of Mars, i. 149; of Jupiter, i.

174; of Saturn's rings, i. 217, 226; of a comet, i. 409.

Philia (Minor Planet (280)), i. 668.

Philip Augustus, King of France, his death preceded by a comet, probably Halley's, i. 443.

Philip's planisphere, iii. 252. Phillips, Prof. J., his estimate of the depth of the Sun's envelopes, i. 53.

Philogoria (Minor Planet (274)), i. 668.

Philolaus, his ideas respecting the Earth's rotation, i. 116.

Philomela (Minor Planet (196)), i. 165,

Philosophia (Minor Planet (227)), i. 666.

Philostratus, the first to mention the solar corona, i. 281.

Phobos, one of the satellites of Mars, i.

Phocea (Minor Planet (25)), i. 654.

Phœnix (constellation), iii. 115, 210.

Photography, as applied to the Moon, i. 140; as applied to the Sun, ii. 395; general account of astronomical, ii. 390; the daguerreotype, ii. 390; the collodion and gelatine processes, ii. 392; advantage of reflectors for photography, ii. 394; adaptation of refractors, ii. 394; solar photography, ii. 396; the two forms of photoheliograph, ii. 396; transits of Venus, ii. 400; total solar eclipses, ii. 401; lunar photography and libration, ii. 402; the first photographs of nebulæ and comets, ii. 346,403; Pickering's determination of stellar magnitudes by photography, ii. 404; Espin's, ii. 405; the Brothers Henry, ii. 405; photograph of the Pleiades, ii. 406; Roberts's photographs of Nebulæ, ii. 407; the Photographic Congress, ii. 409; the Cape Photographic Durchmusterung, ii. 409; photography at the Paris Observatory, ii. 410; stellar parallax, ii. 410; observation of meteors, ii. 411; spectrum photography, ii. 412; Vogel's dyed plates, ii. 412; Abney's infra-red photographs, ii. 413; Huggins's stellar photographs, ii. 413; the Draper Memorial, ii. 414; the province of photography, ii. 415.

Photoheliograph at Kew, ii. 396; at Harvard College Observatory, ii. 397; at Greenwich, ii. 397; at Dehra Dan, ii. 397.

Photometer, ii. 188; Pritchard's wedge, ii. 188; Pickering's meridian, ii. 190. Photometry of the Sun and Moon, i. 7, 8, 138; of the stars, ii. 188, 280; iii. 5.

Bb

Photosphere of the Sun, i. 52. Phthia (Minor Planet (189)), i. 664.

Piazzi, G., discovers the planet Ceres, i. 654; his Catalogue of Stars, ii. 489.

Picard, J., perhaps discovers Saturn's

dusky ring, i. 212.

Piccolomini, applies Roman letters to

certain stars, iii. 17.

Pickering, E. C., his photometric measurements of the satellites of Mars, i. 162; his observations of the solar eclipse of 1869, i. 307; his photographs of the solar eclipse of 1886, i. 319; his meridian photometer, ii. 190; suggests the use of large telescopes in a horizontal position, ii. 193; his Harrard Photometry referred to, ii. 265; iii. 12; his theory as to Algol's variability, ii. 376; his photographs of stars, ii. 404; his Catalogues of Stars, ii. 494, 495, 499; his Catalogues of Nebulæ, ii. 502.

Pictor (constellation), iii. 116, 211.

Pigott, his theory as to variable stars, iii. 48; his Catalogue of Changeable Stars, ii. 488.

Pillar-and-claw stand, ii. 49; conversion

of, into equatorial, ii. 65.

Pingré, A. G., observes vibrations in the tail of the comet of 1769, i. 412; his Cométographie referred to, i. 550; his Catalogue of Comets, ii. 504.

Piola, observes the solar eclipse of 1842,

i. 276.

Pisces (constellation), iii. 115, 212. Piscis Australis (constellation), iii. 115,

Piscis Volans (constellation), iii. 115,

234. Pistor and Martins, their prismatic sector,

ii. 163.

Plane Paron G observes the Moon's

Plana, Baron G., observes the Moon's shadow during a total solar eclipse, i. 285.

Planet, derivation of the word, i. 54.

Planetary nebulæ, iii. 76. Planetoids, i. 164. See Minor Planets.

Planets, epitome of the motions of, i. 54; characteristics common to them all, i. 57; Kepler's laws, i. 57; elements of a planet's orbit, i. 58; curious relations between the distances and the periods of the planets, i. 59; the ellipse, i. 61; popular illustration of the extent of the solar system, i. 63; Bode's law, i. 64; miscellaneous characteristics of the planets, i. 67; curious coincidences, i. 68; conjunctions of the planets, i. 68; conjunctions recorded in history, i. 70; different systems, i. 71; the Ptolemaic system, i. 71; the Egyptian system, i.

72; the Copernican system, i. 72; the Tychonic system, i. 73; spectra of, ii. 339, 387; do not usually twinkle, iii. 25. See the several planets.

Planets, transit observations of, ii. 136;

general observations of, ii. 270.

Planispheres, iii. 251; description of Grosse's, iii. 251; description of Philip's, iii. 252; description of Pritchard's, iii. 252;

Plans and specifications of 2 observa-

tories, ii. 221.

Plantade, observes the transit of Mercury

of 1736, i. 341.

Pleiades, described, iii. 59; the northern limit of the Zodiacal Light, i. 142; Catalogue of Stars in, by C. Wolf, ii. 407; photographs of, by MM. Henry, iii. 406, 410; C. P. Smyth suggests that the Pyramids had something to do with them, iii. 2; referred to in books of Job and Amos, iii. 15; possibly the central point of the solar system, iii. 24; general description of, iii. 59; mentioned by Homer, iii. 59; diagram of, by Miss Airy, iii. 59; by Jeaurat, iii. 59, 60; lithograph of, by Tempel, referred to, iii. 59; suspected variable nebula in, iii. 103.

Pliny, perhaps he observes the Zodiacal Light, i. 144; his opinions on the tides, i. 373; his ideas on the distances of the stars, i. 386; enumerates 12 kinds of comets, i. 457; his statement as to the origin of Hipparchus's Cata-

logue, iii. 54.

Plutarch, mentions the Sun's corona, i. 281; his allusion to the battle of Salamis, i. 323; his Life of Pericles, i. 324; refers to the speculations of Democritus, iii. 112.

Plymouth breakwater, curious occurrence

at, i. 7.

Poczobut, forms the constellation Taurus Poniatowski, iii. 117.

Poey, discussion of tropical storms by, i. 37; his observations of the light of the comet of 1861 for polarisation,

i. 467.

Pogson, N., perhaps observes Biela's comet in 1872, i. 433; his rule as to stars visible by object-glasses of given aperture, ii. 246; his account of a nebula in Scorpio suspected to be variable, iii.101; his Catalogues of Stars, ii. 491, 495.

Poinsinet, suggests Cybele as a name for

Uranus, i. 243.

Polana (Minor Planet (142)), i. 662.

Polaris (a Ursæ Minoris), iii. 232; parallax of, iii. 10; taken both by Pickering and Pritchard as their standard star, iii. 12.

Polarisation of a comet's light, i. 467. Polarising solar eye-piece, ii. 28.

Pole, definition of, ii. 550; North, iii. 2, 232; South, iii. 200.

Pole-star, ii. 140.

Poles of Mars, snow at the, i. 156. Pollux (\$\beta\$ Geminorum), iii. 178, 179; a star of the 1st magnitude, iii. 4, 11; spectroscopic observations of, ii. 353,

Polydorus Vergilius, records a spot on

the Sun, i. 44.

Polyhymnia (Minor Planet (32)), i. 654.

Pomona (Minor Planet (32)), i. 654.

Pompeia (Minor Planet (203)), i. 664.

Pond, J., his Catalogue of Stars, ii. 489. Pons, the fourth discoverer of Encke's comet, i. 416; periodical comet, i. 435. Pontécoulant, P. G. D. De, investigates the theory of the Moon, i. 140; his memoir on Halley's comet, i. 439.

Porta, J. B., his claim to the invention of the telescope, ii. 292.

Position, angles of, ii. 35.

Positive eye-piece, ii. 18.

Pouillet, his estimate of the Sun's heat,

Pound, his observations of the IVth satel-

lite of Jupiter, i. 198.

Powell, Prof. B., his suggestion as to the cause of the corona, i. 280; his theory respecting phenomena seen during transits of Mercury, i. 345; his Catalogue of Double Stars, ii. 497. Præsepe (in Cancer), iii. 61.

Precession, of the equinoxes, i. 374; Polestar, varies owing to, iii. 2; Table of, for ascertaining star places, ii. 537.

Prime vertical, Bessel suggests observa-

tions of stars in, ii. 156.

Priming and lagging of the tides, i. 365. Prince, C. L., on alleged weather cycles, i. 38; his observation of Jupiter's IVth satellite, i. 188; republishes old drawings of Saturn, i. 207; on the brightness of Saturn's dusky ring, i. 28; his observations of the transit of Venus in 1882, i. 350, 351; his observations of the Great Comet of 1882, i. 475; his remarks on & Lyræ, iii. 41.

Principia, Newton's, referred to, i. 437. Prismatic eye-piece, Airy's, ii. 29.

Prismatic sextant, ii. 163.

Pritchard, Rev. C., his wedge photometer, ii. 188; his Uranometria Nova Oxoniensis, ii. 494; iii. 12; his Oxford planisphere, iii. 252.

Procter, R. A., ascertains the period of Mars's rotation, i. 158; on the sizes of Saturn's satellites, i. 233; his altazimuth stand, ii. 54; his alterations of the names of constellations condemned, iii. 118; his Atlas, &c., ii. 504.

Procyon (a Canis Minoris), iii. 150; a star of the 1st magnitude, iii. 3, 11; colour of, iii. 39; twinkling of, iii. 26.

Projection, of stars on the Moon's limb in occultations, i. 356; observations of the Sun by the method of, ii. 267.

Prokne (Minor Planet (194)), i. 664.

Prominences, solar, i. 7, 17, 282; spectro-scopic observations of, ii. 328.

Proper motion of stars, iii. 22; Table of, iii. 23.

Propus (I Geminorum), iii. 179; perhaps the centre of a system, iii. 25.

Proserpine (Minor Planet (26)), i. 654.

Prosperin, suggests Neptune as a name for Uranus, i. 243; calculates in 1795 an orbit for Encke's comet, i. 416.

Protogeneia (Minor Planet (147)), i. 662.

Prymno (Minor Planet (261)), i. 668.

Psyche (Minor Planet (16)), i. 654.

Ptolemy, C., his system of the universe, i. 71; records observations of Mercury, i. 90; records observations of Venus, i. 104; discovers the lunar evection, i. 120; records observations of Mars, i. 162; records observations of Jupiter, i. 198; records observations of Saturn, i. 241; confirms the discovery of precession, i. 377; first notes the refraction of light, i. 391; makes no mention of comets, i. 487.

Pyramids, remarkable circumstance con-

nected with, iii. 2.

Pythagoras, identifies Venus, i. 104; perhaps discovers the obliquity of the ecliptic, i. 110; his speculations as to the Milky Way, iii. 112. Pytheas of Marseilles, is said to have

pointed out the connection between the

Moon and the tides, i. 373.

Q.

Quadrans Muralis, iii. 117. Quadrantid meteors, radiant point of, i. 623, 640. Quadrature of the Moon, ii. 448. Quadruple stars, iii. 28, 40. Quarter-days, in England, ii. 443; in Scotland, ii. 443; mentioned in almanacs, ii. 449.

Quarters of the Moon, ii. 448.

Quetelet, A., his observations of Saturn's ring, i. 211; his Catalogue of Meteor Showers, i. 621, 628.

Radau, R., his elements of Vulcan, i.

Radcliffe Observatory, Oxford, heliometer at, ii. 176.

Radiant points of meteors, i. 605, 636,

Radius vector of a planet, i. 57.

Rain-band, term invented by C. P. Smyth, ii. 315; observations of, by various physicists, ii. 315.

Rainfall and Sun-spots, i. 37; researches by Elvins, i. 37; by Brocklesby, i. 38. Rambaut, A. A., his Catalogue of Stars,

ii. 495. Rammelsberg, analysis of aërolites by, i.

590. Ramsden, J., his dynamometer, ii. 23; setting circle devised by, ii. 206.

Range of the tides, i. 364.

Ranyard, A. C., his observations of the Zodiacal Light, i. 146; his observations of Saturn, i. 204; observes the solar eclipse of 1870, i. 274; his book on Solar Eclipses mentioned, i. 304; his opinion on the corona seen in 1871, i. 314; his photographs of the solar eclipse of 1878, i. 315; suggests a connection between the form of the corona and the number of the Sun-spots, i. 319; photographs an unknown comet during the solar eclipse of 1882, i. 486; his observations of shooting stars in 1885, i. 623.

Rastel, records shooting stars during the reign of William Rufus, i. 616.

Rating instrument, ii. 144.

Reckoning, astronomical and chronological, the difference between, ii. 460. Red flames in eclipses of the Sun, i. 7, 17,

282; spectroscopic observations of, ii.

328.

Red spots on Jupiter, i. 178.

Red Stars, Catalogue of, iii. 291; mostly belong to Secchi's IVth type, ii. 354.

Reed, Captain, his observations of the solar eclipse of 1868, i. 307.

Reflecting circles, ii. 167.

Reflecting telescope, ii. 2, 9, 103, 242, 249; hints on the management of, ii.

Reflex zenith-tube, ii. 170.

Reformation of Calendar, by Julius Cæsar, ii. 424; by Pope Gregory XIII., ii. 425. Refracting telescopes compared with re-

flecting telescopes, ii. 13, 242, 270, 393. Refraction, i. 387; its nature, i. 387; importance of a correct knowledge of its amount, i. 389; Table of the correction for refraction, i. 389; ii. 530; effect of refraction on the position of objects in the horizon, i. 390; history of its discovery, i. 391; formula for correction for, ii. 113; correction for, to be applied to sextant observations, ii. 153; Table of, ii. 530.

Regiomontanus, invited to assist in reforming the Calendar, ii. 426.

Regulus (a Leonis), iii. 188, 189; star of the 1st magnitude. iii. 4, 11; colour of, iii. 39.

Repeating circle, ii. 168.

Resisting medium, i. 419, 425.

Respighi, L., his spectroscopic researches on the solar prominences, ii. 332; his spectroscopic observations of twinkling stars, iii. 26.

Reticulated micrometer, ii. 31, 248. Reticulus Rhomboidalis (constellation), iii. 116, 214.

Retrograde motion of a planet, i. 405. Reversal of lines in spectrum of solar

prominences, ii. 328. Rhea (satellite of Saturn), i. 233, 234,

Rheita, De, his enumeration of the stars in the Pleiades, iii. 59.

Rhodope (Minor Planet (166)), i. 662.

Riccioli, G. B., his map of the Moon, i. 139; his ideas on the distances of the stars, i. 386.

Ricco, A., his observations of Sun-spots, i. 19; observes birds flying across the Sun, i. 179.

Rice-grains on the Sun, i. 49; ii. 399. Richards, Rev. W. J. B., his hints on observing the Moon, ii. 269.

Rigand, S. P., Harriott's papers edited by,

cited, ii. 293.

Rigel (B Orionis), iii. 203, 204; a star of the 1st magnitude, ii. 3, 11; colour of, ii. 39.

Right ascension, ii. 447. Ring micrometer, ii. 43. Rings of Saturn, i. 206.

Rittenhouse, a self-made American astro-

nomer, i. 269.

Roberts, I., his planet indicator, ii. 273; his photographs of nebulæ and clusters, ii. 407; his photograph of the great nebula in Andromeda, iii. 73.

Robertson, his History of America cited,

i. 333.

Robespierre and the French Revolution-

ary Calendar, ii. 441. Robinson, Rev. T. R., his comparisons between refracting and reflecting telescopes, ii. 13; his Catalogue of Stars, ii. 492.

Rödkier, imagines he sees a satellite of

Venus, i. 103.

Rogers, W. A., his Catalogue of Stars, ii. 499.

Roman year, ii. 437.

Romberg, H., his Catalogue of Double Stars, ii. 497.

Römer, discovers the progressive transmission of light by observation of Jupiter's satellites, i. 197.

Romulus, i. 431.

Rosa (Minor Planet (223)), i. 666.

Rosa, drawings of Comet iii. 1860 by, i. 459.

Roscoe, Sir H. E., his interpretation of Kirchhoff's spectroscopic experiments,

Rosenberger, investigates the orbit of

Halley's comet in 1835, i. 439. Rosse, Earl of, telescope of, ii. 6; his account of the spiral nebula 51 M Canum Venaticorum, iii. 74; his Catalogues of Nebulæ, ii. 501; iii. 97.

Rosse, Earl of (II.), his experiments on the Moon's heat, i. 138; applies an equatorial mounting to his 3-feet reflector, ii. 105; spectroscopic observations of nebulæ, ii. 371; his Catalogue of Nebulæ,

Rosser, his Navigation, sextant adjust-

ment cited from, ii. 151.

Rotation of the Sun, i. 14; of the planets, i. 68. See also the several planets.

Rotundity of the Earth, i. 111.

Royer, A., forms some Southern constellations, i. 116.

Rümker, C., observes Encke's comet in the Southern hemisphere in 1822, i. 417; his Catalogues of Stars, ii. 489, 490, 492.

Russell, H. C., his Catalogue of Stars, ii. 499; his account of the cluster κ Crucis,

iii. 89.

Russia (Minor Planet (232)), i. 166.

Russia, still uses the unreformed Calendar,

Rutherfurd, his spectroscopic observations, ii. 353; his photo-lithograph of the solar spectrum, ii. 384.

S.

Sabine, General E., his discovery relating to the magnetic needle, i. 28.

Safarik, observes the ellipticity of Uranus, i. 245; his observations of telescopic

meteors, i. 647. Safford, T. H., his value of Neptune's mass, i. 259; his Catalogues of Stars, ii. 492, 494, 495; his Catalogue of Nebulæ, ii. 502.

Sagitta (constellation), ii. 114, 215.

Sagittarius (constellation), iii. 115, 216; cluster 22 M in, iii. 65; the nebula 51 H IV. in, iii. 80; the nebula 8 M in, iii. 90; void space in, observed by Trouvelot, iii. 111.

Saigey, J. F., his observations of shooting

stars cited, i. 610. Salamis, battle of, i. 323.

Sand-glasses, ii. 445. Sani (Hindù deity), i. 207.

Santini, G., his value of Jupiter's mass, i. 198; investigates the orbit of Biela's comet in 1832, i. 431; his Catalogues of Stars, ii. 490, 491, 492.

Sapientia (Minor Planet (275)), i. 668.

Sappho (Minor Planet (%)), i. 658.

Saros, i. 265.

Satellites of Mars, i. 59, 159; of Jupiter, i. 60, 183; hints on the observation of, ii. 272; spectra of, ii. 340; of Saturn, i. 60, 231; hints on the observation of, ii. 271; of Uranus, i. 60, 247; of Nep-

tune, i. 258.

Saturn, period, &c., i. 200; figure and colour of Saturn, i. 203; belts and spots, i. 203; observations of the belts by Holden, i. 204; by Ranyard, i. 204; bright spot recorded by Hall, i. 205; probable atmosphere, i. 205; observations of Galileo, and the perplexity they caused, i. 206; logogriph sent by him to Kepler, i. 207; Huygens's discovery of the ring, i. 207; his logogriph, i. 207; the bisection of the ring discovered by Cassini, i. 208; Sir W. Herschel's doubts, i. 208; historical epitome of the progress of discovery, i. 211; the "dusky" ring, i. 212; facts relating to the rings, i. 217; appearances presented by them under different circumstances, i. 218; rotation of the ring, i. 220; Secchi's inquiries into this, i. 220; the ring not concentric with the ball, i. 221; measurements by W. Struve, i. 221; other measurements, i. 222; miscellaneous particulars, i. 222; theory of the ring being fluid, i. 222; now thought to consist of an aggregation of satellites, i. 222; the "beaded" appearance of the ring, i. 225; O. Struve's surmise about its contraction, i. 227; irregularities in the appearances of the ansæ, i. 228: rings not bounded by plain surfaces, i. 228; mountains suspected on them, i. 228; an atmosphere suspected, i. 228; physical observations between 1872 and 1876 by Trouvelot, i. 229; observations by MM. Henry, i. 230; by Keeler, i. 230; brightness of rings and ball, i. 231; Bessel's investigations into the mass of the rings, i. 231; Saturn attended by 8 satellites, i. 231; application of Kepler's 3^{r1} law to them, i. 60; Table of them, i. 233; physical data relating to each, . i. 234; elements by Jacob, i. 237; coincidences in the rotation-periods of certain of them, i. 233; transits of Titan, i. 238; celestial phenomena on Saturn, i. 238; Lockyer's summary of the appearances presented by the rings, i. 239; peculiarity relative to the illumination of Iapetus, i. 240; mass of Saturn, i. 240; ancient observations, i. 241; Saturnian astronomy, i. 241; occultations of, i. 358; hints on observations of, ii. 271; spectrum of, ii. 340; spectrum of the rings, ii. 342.

Savary, his application of the law of gravitation to double stars, iii. 34.

Sawerthal, his comet of 1888, i. 481. Sawyer, E. F., his variable star U Ophiuchi, iii. 49.

Scaliger, J. J., devises the Julian Period, ii. 459.

Scarlet, makes reflecting telescopes, ii.

Schedir (a Cassiopeia), iii. 152, 153, 358; perhaps the centre of a system, iii. 25.

Scheiner, C., observes the spots on the Sun, i. 44; uses a polar axis, ii. 67; describes a telescope, ii. 294.

Scheuten, claims to have seen a satellite

of Venus, i. 103. Schiaparelli, J. V., observations of Mars, i. 151; his so-called "Canals," i. 152; measures the ellipticity of Uranus, i. 245; observes belts and spots on Uranus, i. 245; his observations of shooting stars referred to, i. 608; his investigations as to the identity of meteors and comets, i. 630; his Catalogue of Double Stars, ii. 499; observes a nebula in the Pleiades, iii. 103.

Schiller, J., his Maps, ii. 502.

Schjellerup, H, C., his Catalogues of Stars, ii. 492; his Catalogue of Red Stars cited, iii. 201.

Schmidt, J. F.F., observes suspicious round spots on the Sun, i. 79; his map of the Moon, i. 140; his account of the Zodiacal Light referred to, i. 144; his memoir on Twilight, i. 393; his obser-

vations of the Great Comet of 1882, i. 476; drawing of fire-ball observed by, i. 600; his observations of shooting stars referred to, i. 608; observes a telescopic fire-ball, i. 650; his Catalogue of Nebulæ, ii. 501; observes a temporary star in Cygnus, iii. 55. Schönfeld, E., his Catalogue of Nebulæ,

ii. 501; his Southern extension of the

Bonn Durchmusterung, iii. 14.

Schröter, J. J., his observations of Mercury, i. 87, 88; his observations of Venus, 98, 102; asserts the existence of mountains on Venus, i. 99; on the Moon's atmosphere, i. 133; his diagrams of the Moon's mountains, i. 139; observes the transit of Mercury of 1779, i. 341; suspects a change in the nebula 17 M Scuti Sobieskii, iii. 91.

Schubert, General, his opinion as to the

figure of the Earth, i. 108.

Schultz, H., his Catalogue of Nebulæ, ii.

501. Schumacher, H. C., criticises Pastorff's claim to have seen a comet cross the Sun, i. 414; founds the Astronomische

Nachrichten, ii. 482. Schurig, R., his Himmels Atlas referred

to, ii. 264.

Schuster, Dr., his photographs of the solar eclipse of 1875, i. 315; his photographs of the solar eclipse of 1882, i. 317; his photographs of the solar eclipse of 1886,

i. 319; ii. 337.

Schwabe, H., observations of Sun-spots, i. 7, 25; opinion as to spots visible to the naked eye, i. 23; opinion as to disappearance of spots, i. 25; presentation of gold medal to, i. 25; table of observations by, i. 26; his estimate of the period of Sun-spots, i. 34; his views on the brightness of the Sun's surface, i. 44; his observations of Saturn, i. 221; suggests that Saturn's interior ring is variable, i. 228.

Schwerd, G., his Catalogue of Stars, ii.

49I.

Schwink, G., his Map, ii. 503.

Scorpio (constellation), iii. 115, 218; cluster 80 M in, iii. 63, 101; the same mentioned, ii. 367; void spaces in, observed by Sir J. Herschel, iii. 111.

Sculptor, alias Apparatus Sculptoris (constellation), iii. 116, 220.

Scutum Sobieskii (constellation), iii. 116, 221; nebula 17 M in, iii. 91.

Scylla (Minor Planet (155)), i. 166, 662.

Seabroke, G. M., spectroscopic observations by, ii. 373, 375; his Catalogue of Double Stars, ii. 499.

Searle, A., his opinions on the Zodiacal Light, i. 145.

Seas, lunar, i. 124.

Seasons on the Earth, i. 110; on Mars,

i. 158.

Secchi, A., his book Le Soleil cited, i. 2; suggests that the diameter of the Sun is liable to change, i. 5; observation of Sun-spots, i. 17; on the relative brightness of the Sun's surface, i. 43; observations of Mars, i. 151, 156; his measures of Saturn's rings, i. 220; favours the idea of a change in Saturn's rings, i. 227; his observations of the comet of 1861 for polarisation, i. 467; his spectroscopic observations, ii. 329; of comets, ii. 342; his types of stars, ii. 354, 360, 361; observes meteors with a spectroscope, ii. 350; his Catalogue of Double Stars, ii. 497; of Stars by Spectra, ii. 505; his account of the nebulous region in Orion, iii. 87.

Secretan, optician at Paris, equatorials by, ii. 79, 81, 83, 297; transit circles

by, ii. 125, 127.

Sector, Dip-, ii. 168; Zenith-, ii. 168. Secular acceleration of the Moon's mean motion, i. 121.

Sedillot, L. A., claims for Abul Wefa that he discovered the lunar Variation, i.

Seeliger, H., his enumeration of stars of different magnitudes, iii. 14.

Self-focussing eye-pieces, ii. 244. Selwyn, Rev. W., his solar autographs, ii. 396, 397.

Semele (Minor Planet (86)), i. 658.

Semi-axis major of a planet's orbit, i. 58,

Semi-diameter, correction for, in sextant

observations, ii. 153.

Seneca, perhaps he observes the Zodiacal Light, i. 144; notes the extreme tenuity of comets, i. 400; observes a great comet in 146 B.C., i. 410; his ideas on comets, i. 487; attributes the constellations to the Greeks, iii. 16.

Separating power of telescopes, ii. 277. Serpens (constellation), iii. 114, 222.

Serpieri, ascribes to the Zodiacal Light an electrical origin, i. 147.

Setting circle, ii. 206.

Sextans (constellation), iii. 116, 223. Sextant, ii. 149; its invention, ii. 149; description of the instrument, ii. 149; the optical principle on which it depends, ii. 150; its adjustments, ii. 150; corrections to be applied to observations made with it, ii. 153; method of finding the Sun's zenith distance, ii. 154; the artificial horizon, ii. 155; to find the

latitude, ii. 156; to determine the time, ii. 158.

Sextant, Box-, ii. 160, 163; prismatic, ii. 163.

Sextus IV., Pope, proposes to reform the Calendar, ii. 427.

Shadow of the Moon, seen during eclipses of the Sun, i. 285; the velocity with which it travels, i. 267, 285.

Shadow cast by Venus, i. 94; by Jupiter,

i. 182.

Shakerley, J., observes the transit of Mercury of 1651, i. 341.

Shakespeare, W., his allusions to comets,

i. 489.

Sharp, A., his Catalogue of Stars, ii. 488. Sheepshanks, Rev. R., his articles on the Transit Instrument cited, ii. 140; suggests to Admiral Smyth an extempo-

rised driving clock, ii. 252.

Shooting stars, i. 608; have only recently attracted attention, i. 608; are visible with greater or less frequency every clear night, i. 609; summaries of the monthly and horary rates of apparition from observations by Coulvier-Gravier and Denning, i. 610; number of known meteor showers, i. 611; their distribution amongst the constellations, i. 611; monthly number of meteors catalogued, i. 614; early notices of great meteor showers, i. 615; the showers of 1799, 1831, 1832, 1833, 1866, and following years, i. 616; the shower of Aug. 10, i. 620; of Nov. 27, 1872, and Nov. 27, 1885, i. 622; nomenclature of meteor systems, i. 623; views of Olbers, i. 624; monthly summary of great meteoric displays, i. 625.

Short, J., observations by, of the Sun's surface, i. 46; suspects a satellite of Venus, i. 102; said to have seen marks

on Saturn's ring, i. 211.

Shutters for transit instruments, ii. 203.

Sibylla (Minor Planet (168)), i. 662.

Side-transit instrument, ii. 124. Sidereal day, ii. 418; year, ii. 422. Sidereal Messenger (American I (American Magazine) referred to, ii. 263.

Sidereal-time Indicator, ii. 260.

Siderostat, ii. 181.

Signs of the Zodiac, iii. 114. See Zodiac.

Silesia (Minor Planet (257)), i. 668.

Silvered glass reflectors, ii. 9, 250. Simms, F. W., his observations of an occultation of Saturn, i. 358; his Treatise on Instruments cited, ii. 149, 165.

Simms, W., his observations of an occul-

tation of Jupiter, i. 359.

Sirena (Minor Planet (116)), i. 166, 660.

Sirius (a Canis Major), iii. 3, 148, 149; Sir J. Herschel's estimate of its light, iii. 5; Dr. Wollaston's estimate of it, iii. 5; parallax of, iii. 10; brightness of, iii. 11; perhaps the centre of a system, iii. 25; colour of, iii. 39; said to have undergone changes of colour, iii. 39; spectrum of, ii. 353, 374; motion of, in line of sight, ii. 374; Huggins's photographs of the spectrum of, ii.

Sirius (German Magazine) referred to, ii.

Sisson's equatorial, ii. 67; origin of the name, ii. 67.

Sita (Minor Planet (244)), i. 165, 666.

Site, on the choice of, for an observatory, ii. 195.

Siwa (Minor Planet (140)), i. 660.

Slipping-piece, ii. 45. Smeaton's block, ii. 63.

Smith, H. L., his Catalogue of Nebulæ, ii. 500.

Smith, R., his Opticks cited, ii. 295. Smyth, Admiral W. H., notes a strange incident connected with Jupiter's IInd satellite, i. 189; his observations of the lunar eclipse of 1837, i. 329; his observation of an occultation of Aldebaran in 1829, i. 356; his account of the floating collimator, ii. 171; his observatory, ii. 196; his Bedford Catalogue, ii. 264; hints by, to observers, ii. 286; his Cycle of Celestial Objects, ii. 504; his diagram of coloured discs, iii. 39, 295; his diagram of € Lyræ, iii. 41; his chapter on finding the stars, iii. 237.

Smyth, C. P., drawing of the Peak of Teneriffe, i. 128; obtains proofs of the Moon's heat, i. 138; observes the solar eclipse of 1851, i. 275; suggests the use of the spectroscope for predictions of weather, ii. 315; invents the term "rain-band," ii. 315; his suggestions as to maps of the solar spectrum, ii. 381; his remarks on the Pyramids of Gizeh, iii. 2; suggests periodical proper motion for stars, iii. 22.

Snow, suspected, on Venus, i. 101; on Mars, i. 156.

Society for Diffusion of Useful Knowledge, its Maps, ii. 503.

Solar cycle, ii. 458.

Solstices, i. 109; iii. 15.

Sophia (Minor Planet (251)), i. 668.

Sophrosyne (Minor Planet (134)), i. 660.

Sosigenes, assists Julius Cæsar in reforming the Calendar, ii. 424.

South, Sir J., his observations of Mars's atmosphere, i. 159; his Catalogue of Double Stars, ii. 495.

Spectroscope, ii. 182; Browning's star spectroscope, ii. 183; McClean's star spectroscope, ii. 184; the automatic, ii. 185; Young's astronomical, ii. 187.

Spectroscopic Astronomy, ii. 298. Spectrum analysis, i. 53; ii. 298.

Spherical aberration, ii. 13.

Spherical form of the Earth, proofs of, i.

Spica Virginis (a Virginis), iii. 233, 234; a star of the 1st magnitude, iii. 4, 11; colour of, iii. 39.

Spiral nebulæ, iii. 74, 77.

Spitta, his conclusions as to Jupiter's satellites, i. 192.

Sporadic meteors, i. 609; the term obsolete, i. 609.

Spörer, his remarks on the distribution of Sun-spots, i. 13; the alleged discovery of Vulcan, i. 178.

Spots on the Sun, i. 8; discovery of, i. 44; and see under "Sun;" on Jupiter, i. 176; on Saturn, i. 205.

Spring tides, i. 163.

Square-bar micrometer, ii. 44.

Stampfer, his photometric experiments on the Minor Planets, i. 169.

Stands for telescopes, ii. 48, 250; importance of having a good stand, ii. 48; "pillar-and-claw" stand, ii. 49; the "finder," ii. 50; vertical and horizontal rack motions, ii. 50; steadying rods, ii. 52; Cooke's mounting, ii. 52; Varley's stand, ii. 53; Proctor's stand, ii. 54; altazimuth stands for reflectors, ii. 54; Brett's altazimuth mounting for reflectors, ii. 55; other forms of altazimuth stands, ii. 56; interchangeable alta-zimuth and equatorial stands, ii. 62; Smeaton's block, ii. 63.

Stannyan, observes the red flames during the solar eclipse of 1706, i. 283.

Star-finder, ii. 95.

Stark, P., observes a round black spot on

the Sun, i. 78.

Stars, hints on making observations of, ii. 275; Catalogues of, ii. 265, 487; spectra of, ii. 352; photographs of, ii. 402; magnitudes of, iii. 3.

Stars, double, iii. 28; binary, iii. 31; coloured, iii. 36; multiple, iii. 40; variable, iii. 43; Catalogue of Variable,

iii. 271; temporary, iii. 54.

Stars, spectroscopy as applied to, ii. 352; elements discovered in stellar spectra, ii. 353; types of spectra, ii. 353;

Secchi's classification, ii. 354; brighter stars of the different types, ii. 357; Vogel's classification, ii. 359; Lockyer's, ii. 360; relation of the three methods, ii. 362; bright-line spectra, ii. 364; temporary stars, ii. 365; T Corone, ii. 365; Nova Cygni, 1876, ii. 366; Nova Andromedæ, 1885, ii. 367.

Stars, motions of, in the line of sight, ii. 373; comparison of results obtained at different observatories, ii. 373; motion of Sirius, ii. 374; observations of

Algol, ii. 376.

Steinheil, his reflecting telescopes, ii. 9; his transit prism, ii. 259.

Stellar parallax, iii. 6.

Stephan, his observations of the solar eclipse of 1868, i. 304.

Stephania (Minor Planet (220)), i. 666.

Stephen, King of England, an eclipse of the Sun regarded as an omen of his death, i. 325.

Stevelly, his remarks on occultations re-

ferred to, i. 357.

Stewart, B., remarks on magnetic Earthcurrents, i. 31; on the period of Sunspots, i. 34; spots as affected by certain of the planets, i. 35; his early spectroscopic researches, ii. 306.

Stoddard, observes the satellites of Jupiter

with the naked eye, i. 184. Stokes, Sir G. G., his early spectroscopic

researches, ii. 305.

Stone, E. J., his value of the solar parallax, i. 3; traces a connection between Sun-spots and terrestrial temperatures, i. 39; suggests "rice-grains" as a name for phenomena seen on the Sun, i. 49; his observations of the transit of Venus in 1874, i. 350, 351; his investigations as to the transmission of heat from the stars, iii. 21; his Catalogue of Stars, ii. 493; his Cape Catalogue referred to, ii. 494; iii. 122.

Stone, O., his Catalogue of Double Stars,

ii. 498.

Stones, meteoric, i. 589. See Aërolites. Strasser, P. G., his Catalogue of Stars, ii. 494.

Streete, T., observes the transit of Mercury of 1661, i. 361.

Striding level, ii. 130.

Stroobant, his researches on the alleged satellite of Venus referred to, i. 104; his remarks on the Sun and Moon seen in the horizon referred to, i. 391.

Struve, F. G. W., his measures of Saturn, i. 221; his value of the constant of aberration, i. 381; prime vertical instrument erected at Pulkova under his superintendence, ii. 156; his colour observations of stars, ii. 279; on the motion of the solar system, iii. 24; his labours as to double stars, iii. 28; his classification of double stars, iii. 34; generalisations from his Catalogue, iii. 36; his estimate of the number of stars visible to the naked eye, iii. 109; his Catalogues of Double Stars, ii. 495, 496.

Struve, L., his paper on precession cited, i. 375; on the motion of the solar

system, iii. 24.

Struve, O., his notation for Saturn's rings, i. 221; his theory as to Saturn's rings, i. 227; discovers one of the satellites of Uranus, i. 247; observes the solar eclipse of 1842, i. 276; his researches on precession in conjunction with C. A. F. Peters, i. 376; his Catalogue of Stars, ii. 493, 494; his Catalogue of Double Stars, ii. 496, 497; his labours as to double stars, iii. 35; his search for the variable nebula in Taurus, iii. 100.

Struyck, N., his Catalogues of Comets re-

ferred to, i. 550.

Stuart, his Antiquities of Athens cited, ii. 444.

Styles, Old and New, ii. 428.

Suggestions for carrying on astronomical observations, ii. 242.

Summary of facts concerning the calcu-

lated comets, i. 482.

Sun, i. 1; astronomical importance of the Sun, i. 1; solar parallax, i. 2; the means of determining it, i. 2; by observations of Mars, i. 3; by transits of Venus, i. 4, 348; numerical data, i. 5; gravity at the Sun's surface, i. 6; light and heat of the Sun, i. 7; spots, i. 8; description of their appearance, i. 8; how distributed, i. 9; their duration, i. 13; period of the Sun's rotation, i. 14; effect of the varying position of the Earth with respect to the Sun, i. 15; their size, i. 17; instances of large spots visible to the naked eye, i. 17; the great spot of October 1865, i. 20; their periodicity, i. 25; discovered by Schwabe, i. 25; table of his results, i. 26; table of Wolf's results, i. 27; curious connection between the periodicity of Sun-spots and that of other physical phenomena, i. 28; the diurnal variation of the magnetic needle, i. 29; singular occurrence in September 1859, i. 31; Wolf's researches, i. 33; spots and terrestrial temperatures and weather, i. 36; Ballot's inquiry into terrestrial temperatures, i. 39; the physical nature of spots, i. 40; the Wilson-

T.

Herschel theory, i. 40; luminosity of the Sun, i. 42; historical notices, i. 44; Scheiner, i. 44; faculæ, i. 45; luculi, i. 46; Nasmyth's observations on the character of the Sun's surface, i. 46; Huggins's conclusions, i. 50; present state of our knowledge of the Sun's constitution, i. 52; Tacchini's conclusions, i. 53; hints on observing the, ii. 266; the best time of day for doing so, ii.

269; photographs of, ii. 397. Sun, spectroscopy as applied to, ii. 299, 308; elements recognised in the Sun, . ii. 308; the telluric lines, ii. 311; researches of Janssen, ii. 311; and Egoroff, ii. 312; Cornu's device, ii. 313; the rain-band, ii. 315; spectra of Sunspots, ii. 316; observations at Greenwich, ii. 317; Stonyhurst, ii. 321; and South Kensington, ii. 322; behaviour of iron lines, ii. 323; Lockyer's dissociation theory, ii. 323; spectra of faculæ, pores, and granules, ii. 327; spectra of prominences, ii. 328; method of observing them in full sunshine, ii. 328; their systematic observation, ii. 328; connection with spots and faculæ, ii. 333; spectrum of the chromosphere, ii. 335; spectrum of the corona, ii. 336; its threefold character, ii. 336; spectrum of the Zodiacal Light, ii. 338.

Sun-dials, made by Sir I. Newton, i. 74; the construction of, referred to, ii.

Sun-rise and sun-set, methods of reckoning, ii. 432, 447.

Sunday, ii. 434. Sunday letter, ii. 454. Superior planets, i. 56.

Surfaces of the Sun and planets, i. 652. Sweeping for comets, &c., ii. 93.

Swift, Dean, his Gulliver's Travels quoted as regards Mars, i. 162.

Swift, L., observes Baily's beads in 1878, i. 278; observes the comet of 1881 (ii.) to have a very long secondary tail, i. 412; his observations of telescopic meteors, i. 646; his notes on the nebula 17 M Clypei Sobieskii, iii. 91.

Swift's periodical comet, i. 415, 426, 538-542 passim; claims to have discovered Intra-Mercurial planets, i. 83.

Sylvia (Minor Planet (87)), i. 166, 658. Symbols of the Major Planets, i. 651; of

the Minor Planets, i. 164. Symons, G. J., his meteorological observa-

tions during solar eclipses, i. 276. Synodical revolution of the Moon, i. 137; ii. 448; of the planets, i. 651.

Systems of the universe, i. 71.

Tables of the Major Planets, i. 651; of the Moon, i. 140; of Comets recorded, i.485; of Equation of Time, ii. 421; for the Conversion of Time, ii. 518; for ascertaining Dates of Events, ii. 528; of Refraction, ii. 530; of Precession, ii.

Tacchini, his ideas on solar phenomena, i. 53.

Tail-piece for a telescope, ii. 50.

Tails of comets, i. 410. Taintor, E. C., his Catalogue of Stars, ii.

494. Talbot, F., his spectroscopic researches, ii. 306.

Talmage, C. G., looks for the nebula in Taurus supposed to be variable, iii. 101; his Catalogues of Double Stars, ii. 497, 498.

Tarrant, K. J., his Catalogue of Double

Stars, ii. 499.

Taurus (constellation), iii. 114, 224; radiant point of meteors in, i. 642; the "Crab nebula" in, iii. 85; variable nebula in, iii. 99.

Taurus Poniatowski (constellation), iii. 117.

Taylor, T. G., his observations of η Argûs, iii. 47; his Catalogues of Stars, ii. 490,

Taylor, his spectroscopic observations of nebulæ, ii. 370.

Tcheou-Kong, perhaps determines the obliquity of the ecliptic, i. 110.

Tebbutt, J., observes the transit of Mercury of 1881, i. 344; discovers the Great Comet of 1861, i. 457; its spectrum, ii. 346, 387; photographs of, by Common and Draper, ii. 403.

Telescopes, ii. 1; two kinds of, ii. 2; reflecting telescopes, ii. 2, 54, 103; the Gregorian reflector, ii. 2; the Cassegrainian reflector, ii. 2; the Newtonian reflector, ii. 2; the Herschelian reflector, ii. 5; Lord Rosse's large reflector, ii. 6; Nasmyth's reflector, ii. 9; Browning's mountings for reflectors, ii. 10; adjustment of reflectors, ii. 11; refractors and reflectors compared, ii. 12, 13, 242, 270, 393; refracting telescopes, ii. 13, 242, 291; spherical aberration, ii. 13; chromatic aberration, ii. 13; tests for both, ii. 14; theory of achromatic combinations, ii. 14; tests of a good object-glass, ii. 14; the dialyte, ii. 17; the Galilean refractor, ii. 18; history of, ii. 291; early history lost in obscurity, ii. 291; Vitello, . ii. 291; Roger Bacon, ii. 291; Dr.

Dee, ii. 292; Digges, ii. 292; Borelli's endeavour to find out who was the inventor, ii. 292; his verdict in favour of Jansen and Lippersheim of Middleburg, ii. 292; statements by Boreel, ii. 293; Galileo's invention, ii. 293; Scheiner's use of two double-convex lenses, ii. 294; lenses of long focus used towards the close of the 17th century, ii. 294; invention of reflectors, ii. 294; labours of Newton, ii. 295; of Halley, ii. 295; of Bradley and Molyneux, ii. 295; of Mudge, ii. 295; of Sir W. Herschel, ii. 295; of the Earl of Rosse, ii. 295; of Lassell, ii. 295; improvements in refracting telescopes, ii. 296; labours of Hall, ii. 296; of Euler, ii. 296; of the Dollonds, ii. 296; the largest refractors yet made, ii. 296.

Telescopic meteors, i. 644.

Telescopium (constellation), iii. 116, 226.

Telluric lines, ii. 311.
Tempel, W., his drawing of the solar eclipse of 1860, i. 299; his observations of the Great Comet of 1882, i. 476; suspects the variability of a nebula in Pleiades, iii. 102; discovers Minor

Planets, i. 656, 658. Tempel's first periodical comet, i. 415,

426, 539-41 passim, 548.

Tempel's second periodical comet, i. 415,

424, 539-41 passim, 548.

Tempel's third periodical comet (alias Swift's comet), i. 426, 538-42 passim,

Temperatures, terrestrial, and Sun-spots,

i. 36, 38.

Temporary stars, iii. 54; probably variables, iii. 57; spectroscopic observations of, ii. 368.

Teneriffe, Peak of, i. 128.

Tennant, Major J. F., his observations

of the solar eclipse of 1868, i. 304; his observations of the solar eclipse of 1871, i. 309, 313; suggests the use of the spectroscope during total solar eclipses, ii. 328.

Terby, F., his Areographie cited, i. 148;

his drawing of Saturn, i. 225. Terminator, of the Moon, i. 124.

Terpsichore (Minor Planet (81)), i. 658.

Tests for telescopes, ii. 15, 17; for levels,

Tethys (satellite of Saturn), i. 232, 233,

Thalen, T. R., his spectroscopic researches, ii. 309; his map of the solar spectrum, ii. 381.

Thales, eclipse of, i. 321.

Thalia (Minor Planet (23)), i. 654.

Themis (Minor Planet (24)), i. 654.

Theophanes, Byzantine historian, records meteors, i. 615.

Theophrastus, mentions the cluster Præsepe, iii. 61; his idea of the Milky Way, iii. 112.

Theory of meteors, i. 626.

Thermometer, use of, in determining refractions, i. 389; as an adjunct to an observatory, ii. 220.

Thetis (Minor Planet (17)), i. 654.

Thisbe (Minor Planet (88)), i. 658.

Thius, at Athens observes an occultation of Saturn by the Moon, i. 241.

Thollon, his spectroscopic researches, ii. 312, 327; his map of the solar spectrum, ii. 384; to be completed by Trépied, ii. 384.

Thorpe, B., his edition of the Anglo-Saxon

Chronicle cited, i. 325.

Thucydides, cited, i. 324, 333.

Thule (Minor Planet (279)), i. 165, 668.

Thulis, the third discoverer of Encke's Comet, i. 416.

Thusnelda (Minor Planet (219)), i. 666.

Thwart Circle, an old English name of the Ecliptic, i. 116.

Thyra (Minor Planet (115)), 660.

Tidal-day, definition of, i. 163.

Tides, i. 361; physical cause of the tides, i. 360; attractive force exercised by the Moon, i. 362; by the Sun, i. 362; Spring tides, i. 363; Neap tides, i. 363; summary of the principal facts, i. 363; priming and lagging, i. 365; diurnal inequality, i. 365; local disturbing influences, i. 366; Table of Tidal Ranges, i. 367; influence of the wind, i. 367; experiment of Smeaton, i. 367; the tides in the Severn at Chepstow, i. 368; Tidal phenomena in the Pacific Ocean, i. 368; remarks by Beechey, i. 369; velocity of the great terrestrial tidal wave, i. 369; its course round the earth, sketched by Johnston, i. 370; effects of tides at Bristol, i. 371; instinct of animals, i. 371; tides extinguished in rivers, i. 371; instances of abnormal tidal phenomena, i. 371; the "Mascaret" on the Seine, i. 371; historical notices, i. 373; mention made of, in almanacs, ii. 448.

Tietjen, F., discovers a minor planet, i.

Time, determination of, by transit instrument, ii. 134; by the sextant, ii. 160.

Time generally, ii. 417; what time is, ii. 417; the sidereal day, ii. 418; its length, ii. 418; difference between the sidereal day and the mean solar day, ii. 419; the equation of time, ii. 420; the anomalistic year, ii. 422; use of the gnomon, ii. 422; length of the solar year according to different observers, ii. 423; the Julian Calendar, ii. 424; the Gregorian Calendar, ii. 425; Old Style versus New Style, ii. 427; Romish miracles, ii. 429.

Time-gun, ii. 445.

Timocharis, i. 105, 377.

Tirza (Minor Planet (267)), i. 668.

Titan (satellite of Saturn), i. 233, 234, 237; transits of, 238.

Titania (satellite of Uranus), i. 247.

Titius, the originator of "Bode's Law,"

Todd, D. P., his design for a comet-seeker,

Tolosa (Minor Planet (138)), i. 660.

Torricelli, claims to have first seen the belts of Jupiter, i. 176.

Total eclipses of the Sun, i. 273, 286, 295,

Toucan (constellation), iii. 115, 227; the globular cluster 47 in, iii. 83.

Trabes, perhaps the Zodiacal Light, or the Aurora Borealis, i. 144.

Trans-Neptunian planet (the supposed), i. 260.

Transit Circle, ii. 147.

Transit instrument, ii. 118; its importance, ii. 118; description of the portable transit, ii. 118; adjustments of the transit, ii. 129; four in number, ii. 129; method of performing them, ii. 129; example of the manner of recording transit observations of stars, ii. 134; of the Sun, ii. 136; remarks on observations of the Moon, ii. 137; of the larger planets, ii. 138; mode of completing imperfect sets of transit observations, ii. 138; the uses to which the transit instrument is applied, ii. 140; form for recording observations, ii. 287.

Transit prism, Steinheil's, ii. 259. Transit theodolite, ii. 165.

Transits of Planets, i. 337; use of, suggested by Halley, i. 2; cause of the phenomena, i. 337; Lord Grimthorpe's statement of the case, i. 338; long intervals between each recurrence, i. 340; useful for the determination of the Sun's parallax, i. 339; list of transits of Mercury, i. 340; of Venus, i. 340; transit of Mercury of Nov. 7, 1631,

i. 341; predicted by Kepler, i. 341; observed by Gassendi, i. 341; transit of Nov. 3, 1651, i. 341; observed by Shakerley, i. 341; transit of May 3, 1661, i. 341; transit of Nov. 7, 1677, i. 341; others observed since that date, i. 341; transit of Nov. 9, 1848, i. 342; observations of Dawes, i. 342; of Forster, i. 342; transit of Nov. 11, 1861, i. 342; observations of Baxendell, i. 342; transit of Nov. 5, 1868, i. 343; transit of May 6, 1878, i. 344; transit of Nov. 7, 1881, i. 344; summary by Jenkins of the main features of a transit, i. 344; transit of Venus of Nov. 24, 1639, i. 346; observed by Horrox and Crabtree, i. 346; transit of June 5, 1761, i. 348; transit of June 3, 1769, i. 348; where observed, i. 348; singular phenomenon seen on both occasions, i. 348; explanatory hypothesis, i. 349; other phenomena, i. 349; transit of Dec. 8, 1874, i. 350; transit of Dec. 6, 1882, i. 350; observations by Prince and Langley, i. 353.

Transits of Jupiter's satellites, i. 188; of shadow of Saturn's satellite Titan, i,

238.

Trapezium of Orion, iii. 86, 87.

Trépied, his observations of Pons's comet in 1884, i. 436; his spectroscopic researches, ii. 327.

Trettenero, his Catalogue of Stars, ii.

Triangular star-discs, ii. 276.

Triangulum (constellation), iii. 114, 228. Triangulum Australe (constellation), iii. 115, 229.

Triple stars, iii. 28, 40.

Troughton, E., meridian circle made by, ii. 147; thought to have invented setting circles, ii. 206.

Trouvelot, L., his observations of Jupiter's Ist satellite in transit, i. 191; his observations of Saturn's rings, i. 229; on the colour of Saturn, i. 231; black void in Sagittarius observed by, iii. 111,

Tubes for telescopes, ii. 46, 116.

Tupman, Colonel G. L., his observations of the Zodiacal Light, i. 146.

Turner, H. H., his spectroscopic observations of the Sun when eclipsed, ii. 337.

Tuttle, H. P., suggests the variability of a nebula in Draco, iii. 102.

Tuttle's periodical comet, i. 415, 430, 522-44 passim, 548.

Twilight, i. 116, 392; Schmidt's Memoir referred to, i. 393.

"Twin" equatorial, ii. 103.

Twining, A. C., his Paper on Occultations referred to, i. 360

Twinklings, iii. 25.

Tyche (Minor Planet (258)), i. 668.

Tycho (lunar mountains), i. 123.

Tycho Brahe, his system of the universe described, i. 73; perhaps discovers the Moon's variation, i. 120; investigates refraction, i. 392; his Catalogue of Stars, ii. 488; his observations of the temporary star of 1572, iii. 54.

Tychonic system, i. 73.
Tyndall, J., investigates the heat ascribed

to the Moon, i. 138.

U

Ulugh Beigh, his Catalogue of Stars referred to, ii. 488; iii. 57. Umbriel (satellite of Uranus), i. 247.

Una (Minor Planet (160)), i. 662.

Undina (Minor Planet (92)), i. 658. Universal equatorial, ii. 72, 78, 104.

Urania (Minor Planet (30)), i. 654.

Uranometria Argentina, commented on,

iii. 120.
Uranus, i. 242; circumstances connected with its discovery by Sir W. Herschel, i. 242; names proposed for it, i. 243; early observations, i. 244; period, &c., i. 244; physical appearance, i. 245; belts visible in large telescopes, i. 246; position of its axis, i. 246; attended by 4 satellites, i. 247; application of Kepler's 3rd law to the satellites of, i. 60; table of them, i. 247; miscellaneous information concerning them, i. 248; mass of Uranus, i. 250; Tables of Uranus, i. 250; spectrum of, ii. 341.

Urda (Minor Planet (167)), i. 662.

Ursa Major (constellation), iii. 114, 229; binary star & in, iii. 33, 34; planetary nebula 97 M in, iii. 76.

Ursa Minor (constellation), iii. 114, 232.

V.

Vala (Minor Planet (131)), i. 660.

Valda (Minor Planet (262)), i. 668.

Valz, B., his elements of Vulcan, i. 78; anticipates the discovery of a trans-Uranian planet, i. 253; his remarks on the tails of certain comets, i. 411; discovers Encke's comet in 1825, i. 418. Vanadis (Minor Planet (240)), i. 666.

Varela, his observations of the ansæ of

Saturn's ring, i. 225.

Variable nebulæ, iii. 99; nebula in Taurus, iii. 99; observations by Hind, iii. 99; variable nebula in Scorpio, iii. 101; observations by Pogson and others, iii. 101; notes of observations on the other nebulæ suspected to be variable, iii. 102; the controversy respecting the nebula surrounding η Argus, iii.

103.

Variable stars, iii. 43; o Ceti, iii. 43; Algol, iii. 45; δ Cephei, iii. 45; β Lyræ, iii. 46; R Coronæ Borealis, iii. 46; γ Argûs, iii. 46; Boulliaud's theory, iii. 48; miscellaneous remarks, iii. 48; list of prominent variable stars, iii. 49; variable stars of the Algol type, iii. 49; U Ophiuchi, iii. 49; Chandler's generalisations on the colours and periods of variable stars, iii. 50; statistics by Espin, iii. 51; temporary stars, iii. 54; notices of stars which have disappeared, iii. 56; are temporary stars and variable stars identical in character? iii. 57; Catalogue of, iii. 271; of stars probably variable, iii. 286; spectra of, ii. 365.

Variation of the Moon, i. 120.

Varley's stand, ii. 53.

Vassenius, describes the Red Flames seen during the solar eclipse of 1715, i. 284; observes irregularities in the Moon's surface during a solar eclipse, i. 285.

Vega (a Lyræ), iii. 195, 196; a star of the 1st magnitude, iii. 3, 11; will one day be the Pole-star, iii. 2; parallax of, iii. 10; perhaps the centre of a system, iii. 25; twinkling of, iii. 26; a green star, iii. 39; spectrum of, ii. 353; Huggins's photographs of the spectrum of, ii. 385.

Velleda (Minor Planet (126)), i. 660.

Velocity of tidal wave, i. 369; of light, i.

380

Venus, i. 93; transits of, i. 2, 345; period, &c., i. 93; phases resemble those of Mercury, i. 94; most favourably placed for observation once in 8 years, i. 94; observations by Lihou, i. 95; by Lacerda, i. 96; daylight observations, i. 97; its brilliancy, i. 98; its spots and axial rotation, i. 98; suspected mountains and atmosphere, i. 99; its "ashy light," i. 101; phase irregularities, i. 102; suspected satellite, i. 102; alleged observations of it, i. 103; the mass of Venus, i. 104; ancient observations, i. 104; Galileo's anagram announcing

his discovery of its phases, i. 105: Venus useful for nautical observations, i. 105; Tables of Venus, i. 105; hints on observations of, ii. 270; spectroscopic observations of, ii. 339; probable influence of, on spots on the Sun, ii. 399; photographic records of, ii. 400.

Vera (Minor planet (245)), i. 666.

Vernal equinox, i. 109, 375.

Vesta (Minor Planet 4), i. 165, 166, 167, 654.

Vibilia (Minor Planet (144)), i. 662.

Victoria (Minor Planet (12)), i. 654.

Villarceau, A. F. J. Y., his account of the perturbations of D'Arrest's comet, i. 427.

Vindobona (Minor Planet (231)), i. 666.

Virginia (Minor Planet (51)), i. 656.

Virgo (constellation), iii. 115, 233; symbolic of harvest-time, iii. 15.

Vitello, a Pole who uses lenses, ii. 291. Vitruvius, his De Architecturá cited, ii.

444, 445. Vocabulary of Definitions, ii. 541.

Vogel, H. C., on the relative brightness of the Sun's surface, i. 43; his observation of the Zodiacal Light, ii. 338; his spectroscopic observations of Jupiter's satellites, ii. 340; of Uranus, ii. 341; types of stars, ii. 359; divides the spectra of stars into 3 classes, ii. 359; his spectroscopic survey of the Northern heavens, ii. 359; his map of the solar spectrum, ii. 383; his Catalogue of Stars by Spectra, ii. 505.

Volans, alias Piscis Volans (constella-

tion), iii. 115, 234.

Volcanic formation of the Moon, i. 124. Voltaire, his Micromegas quoted with re-

spect to Mars, i. 162.

Volume of the Sun, i. 5; of the planets, i. 632. See also the several planets.

Vulcan, i. 75; Le Verrier's investigation of the orbit of Mercury, i. 75; narrative of the discovery of Vulcan, i. 76; Le Verrier's interview with Lescanbault, i. 76; approximate elements of Vulcan, i. 77; observations by Lummis at Manchester, i. 77; instances of bodies seen traversing the Sun, i. 78; Hind's opinion, i. 80; alleged intra-Mercurial planets discovered in America by Watson and Swift on July 29, 1878, i. 82.

Vulpecula (constellation), iii. 235; "Dumb-bell" nebula in, iii. 91.

Vyse, Colonel, his researches as to the Pyramids of Egypt, iii. 2. Walker, S. C., his Tables of Neptune, i.

Wallis, J., observes Jupiter without visible satellites, i. 195; observes an occultation of Saturn in 1825, i. 359; publishes a tidal theory, i. 373.

Walpurga (Minor Planet (256)), i. 668.

Walther, his value for the length of the year, ii. 423.

Wargentin, R., his calculations as to eclipses of Jupiter's satellites, i. 194; his observations of the lunar eclipse of 1761, i. 328; his observations of an occultation in 1761, i. 336.

Warner and Swasey, equatorial by, ii. 89; driving-clock by, ii. 77.

Wartmann, L. F., his observations of shooting stars in 1835-8, i. 623.

Washburn Observatory, ii. 237.
"Watling-Street," an old name of the
Milky Way, iii. 111.

Watson, claims to have discovered Intra-Mercurial planets, i. 82.

Wax model of the Moon by Madame Witte, i. 140.

"Way to St. James's," an old name of the Milky Way, iii. 111.

Weather influences imputed to the Moon, i. 140.

Weather-cock, ii. 220.

Webb, Rev. T. W., observations of Venus, i. 101; his description of the Moon cited, i. 128, 140; believes Saturn's interior ring to be variable, i. 228; his observations of the comet of 1861 referred to, i. 458; his observations of the fire-ball of 1861, i. 602; his tests of an object-glass, ii. 15; his Celestial Objects referred to, ii. 264, 504; his comments on the analysis of Struve's stars, iii. 37.

Wedge, observation of star magnitudes by means of, ii. 188, 281; iii. 12.

Week, days of the, ii. 433; Table for ascertaining, ii. 528.

Wells's comet, i. 542; spectrum of, ii.

Welser, third letter addressed to, by Galileo, i. 46, 206.

Wendell, hints as to micrometer measurements of suspicious objects, ii. 273.

Weringia (Minor Planet (226)), i. 666.

Wesley, W. H., his summary of the observations of recent eclipses, i. 311.

Westphal, his periodical comet, i. 435, 532.

Whatton, Rev. A. B., his Memoir of Horrox cited, i. 347. Whewell, Rev. W., his Table of Tidal

Velocities, i. 370.
"Whirlpool" or spiral nebulæ, iii. 74.
Wichmann, M., determines the Moon's diameter, i. 118; determines the inclination of the Moon's axis, i. 119.

Wilkes, Captain C., his observations of

the Zodiacal Light, i. 145. William I., King of England, Halley's comet considered his forerunner, i. 444, 488.

William II., King of England, shooting stars seen during his reign, i. 616.

William IV., Landgrave of Hesse, has an observatory with a revolving roof, ii. 198; his Catalogue of Stars, ii. 488. Williams, G., his drawings of the Great

Comet of 1861, i. 465.

Williams, J., his Catalogue of Chinese Comets referred to, f. 552; ii. 505. Willis, General G. H., his observations

of the Great Comet of 1882, i. 478. "Willow-leaves" on the Sun, i. 46.

Wilson, his theory of Sun-spots, i. 40.

Window Equatorial, ii. 78.

Window Transit instrument, ii. 143, 144. Wing, V., his Astronomia Britannica cited, i. 341.

Winlock, J., his Catalogue of Stars, ii.

Winnecke, F. A. T., his periodical comet, i. 415, 424, 538-45 passim, 548; his observations of Venus, i. 101.

Wisniewski, observes the comet of 1811,

i. 446.

With, observes oscillations in Coggia's comet, i. 412; his reflecting telescopes,

Witte, Madame, her wax model of the

Moon, i. 140.

Wolf, R., note by, on the periodicity of Sun-spots, i. 25; Table of Observations by, i. 27; historical researches on Sunspots, i. 33; spots as affected by the Major Planets, i. 35.

Wolf, Dr., his periodical comet, i. 415,

429.

Wolf and Rayet, their observations of Coggia's comet in 1874, i. 473.

Wollaston, F., his estimate of the Sun's light, i. 8; his observations of Sun-spots, i. 24; his estimate of the Moon's light, i. 138; his investigations on the solar spectrum, ii. 301; his Catalogue of Stars, ii. 489; his Maps, ii. 502; his estimate of the light of Sirius, iii. 5.

Wood's alloy, i. 125. Woolhouse, W. S. B., his Paper on

Eclipses referred to, i. 269.

Wrangel, anecdote by, respecting the satellites of Jupiter, i. 184.

Wray, W., his observations of Saturn's dusky ring, i. 217.

Wright, T., suggests the central Sun hypothesis, iii. 24; his spectroscopic observations of the Zodiacal Light, ii. 338.

Wrottesley, Lord, his Catalogue of Stars, ii. 490, 491.

Wrottesley, Hon. J., his Catalogue of Stars, ii. 490.

Wurzelbaur, J. P., observes the transit of Mercury of 1697, i. 341.

X.

Xantippe (Minor Planet (156)), i. 662. Xenophon, his Anabasis cited, i. 322.

Y.

Yarnall, M., his Catalogue of Stars, ii.

493.

Year, ii. 442; mean sidereal, ii. 422; anomalistic, ii. 422; mean solar, ii. 423, 455; of different nations, ii. 436; Egyptian, ii. 436; Jewish, ii. 436; ancient Greek, ii. 346; Roman, ii. 436.

Young, C. A., observes a storm on the Sun, i. 32; his criticism on the alleged Intra-Mercurial planets referred to, i. 85; measures the ellipticity of Uranus, i. 245; observes belts on Uranus, i. 245; witnesses the reversal of lines in the spectrum of a Sun-spot, ii. 319; his description of the spectrum of the

Sun's chromosphere, ii. 333, 334. Young, J. R., his Nautical Astronomy

referred to, ii. 149. Young and Forbes, their value of the velocity of light, i. 380.

Z.

Zach, Baron F. X. De, organises a search for Minor Planets, i. 168; his Catalogues of Stars, ii. 489; missing stars, iii. 57; his Catalogue of Red Stars, iii. 291.

Zelia (Minor Planet (169)), i. 662.

Zenger, C. V., observations of Venus, i. IOI.

Zenith sector, ii. 168; tube, reflex, 170. Zeno, his ideas on comets, i. 487.

Zodiac, motion of the Sun through, i. 7; constellations in, iii. 114, 242; invention of, i. 117; iii. 15.

Zodiacal Light, general description of it, i. 142; when and where visible, i. 142; Sir J. Herschel's theory, i. 143; historical notices, i. 144; modern observations of it, i. 144; Backhouse's conclusions, i. 147; Gronemann ascribes a terrestrial origin to it, i. 147; Serpleri ascribes an electrical origin to it, i. 147; spectrum of, as seen by various observers, ii. 338.

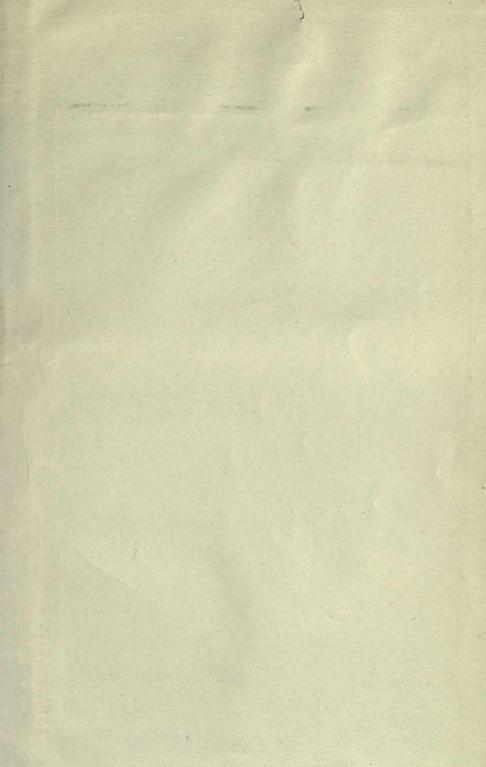
Zöllner, J. C. F., his estimate of the Sun's

light, i. 8; of the brightness of a Sunspot, i. 43; doubts the existence of an atmosphere on Mercury, i. 80; his estimate of the Moon's light, i. 138; his estimate of Jupiter's reflective power, i. 182; his spectroscopic researches, ii. 331.

Zone of Sun spots, i. 9. Zone reticle, i. 45. Zucchi, discovers the belts of Jupiter, i. 176.



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